Operation and Installation manual

SOLIVIA 15 EU G4 TL and
SOLIVIA 20 EU G4 TL

EU

This manual is subject to change.

Please check our website at www.solar-inverter.com

for the most up-to-date manual version.

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1. General Information

1.1 About this Manual

This manual provides the detail information for the specification, installation procedures and all related functional settings of the solar inverter model - SOLIVIA 15EUG4TL / SOLIVIA 20EUG4TL. Installation technicians must be well-trained and qualified for installing solar system and must follow all the safety instruction and installation procedures.

1.2 Safety Symbols & Instruction

CAUTION!
Machine and equipment damage may occur if this hazardous situation is not avoided

WARNING!
Death and serious injury may occur if this hazardous situation is not avoided

DANGER!
Death and serious injury will occur if this hazardous situation is not avoided

WARNING! BURN HAZARD
The enclosure temperature may exceed 70° C while inverter is in operation. A dangerous burn hazard is present in this situation. Please do not touch!

1.3 Validity

This user manual describes the installation procedures, maintenance, technical data and safety instruction of the following solar inverter models under the DELTA brand.

- **SOLIVIA 15EUG4TL**
- **SOLIVIA 20EUG4TL**

Valid with software version: Dsp.-version 1.77, Red.-version 1.35, Comm.-version 1.44

The software version of your inverter is found on the inverter display. Please find more information in section 6.35 “Inverter Information.”

1.4 Product Description

The SOLIVIA 15 TL and 20 TL are 3 phase grid-tied solar inverters with reactive power control. These devices convert direct current (DC) electricity from photovoltaic power collected from PV arrays into 3 phase alternating current (AC) to feed the excess capacity back to the local mains

electrical grid. Using cutting-edge technology allows a wide voltage input range (200~1000 V) and high performance efficiency based on a user-friendly operation design. In addition, special DSP (Digital Signal Processor) design decreases the circuit complication and electronic components. Please note that this device does not support off-grid function. The following are the key features of SOLIVIA 15 TL and 20 TL 3 phase grid-tied solar inverters.

Key Features

- Power Rating: 15/20 kVA
- 3-Phase (3-Phase + N + PE), Grid-tie, Transformerless solar inverter
- Maximum efficiency: > 98.0 % (both models)
- Europe efficiency: 97.8 % for 15 TL and 20 TL
- Reactive power capability (Cap 0.80 - Ind 0.80)
- Low input current harmonic distortion (THD < 3%) @ full load
- 2 MPP Trackers
- Record up to 30 event logs.
- 5” LCD display

The SOLIVIA 15 TL and 20 TL inverters comply with the latest country regulations and standards. Please see the 15 TL and 20 TL specification in section 12.1 in the appendix for the complete list of compliance standards.

1.5 Application & Usage

The operation of the solar inverter is as shown as the figure 1-1. In order to save energy and electricity, solar inverters convert the DC input power supplied from the PV array into three-phase AC output power to the grid.

1.6 Grid Interface

Several different safety systems make up the grid interface:

- VFM (Voltage and Frequency Monitoring)
- RCD (Residual Current Detection)
- DCD (Direct Current Detection)
- Controlling redundant AC relays for each grid phase.

1.7 Additional Information

For more detailed information about the SOLIVIA 15 TL and 20 TL or other related product information, please visit the website at http://www.solar-inverter.com for more support.

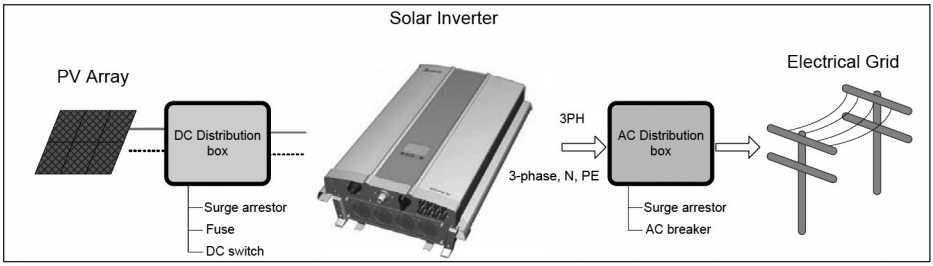


Figure 1.1.: Solar Inverter System Operation Illustration

1.8 Monitoring

The SOLIVIA 15 TL and 20 TL include a display for monitoring performance on location. Remote monitoring is also an option. Please contact your Delta supplier for more information on remote monitoring options.

2. Preparing for Installation

2.1 Instruction before Installing

Due to the variety of user installation environments, reading the manual thoroughly before installation is strongly recommended. All the installation and start-up procedures must be undertaken by a professional and well-trained technician.

2.2 Checking the Package

There might be some unpredictable situations during transportation. Please check if there is any damage to the cardboard carton. After opening the package, please check both the outer case and inner part of this inverter as below.

1. Check the right side on the inverter case to ensure the model number and the specification is the same with the model you have purchased.
2. Check if there are any loose components.
3. Check if all the accessories are in the package, the standard accessories are listed in the below table:

Item	Quantity	Description
15 TL or 20 TL Solar Inverter	1	15 kVA or 20 kVA solar inverter
User Manual	1	User installation and operation instructions
AC Plug	1	Connector for AC connection
Mounting Bracket	1	Bracket to install the inverter on the wall

Table 2.1.: Packing List

NOTE

When there is outer or inner damage on the inverter or there is any missing or damaged standard accessories, please contact your inverter supplier for support.

2.3 Unpacking

1. Open the top of the cardboard box as shown in the figure below.
2. Remove the top packing material after opening the box.
3. Lift the Inverter out of the package and save the packaging in case of return.

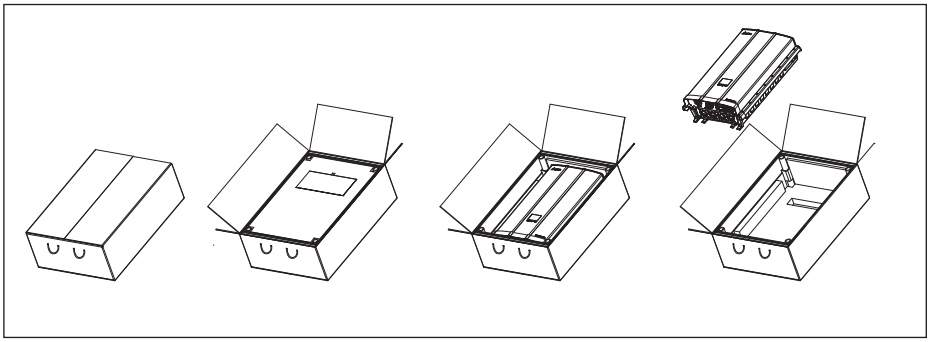


Figure 2.1.: Unpacking Process

2.4 Identify the Inverter

User can identify the model number by the information on the product label. The model number, specification as well as the series no. is specified on the product label. In regard to the label location, please refer to the below figure.

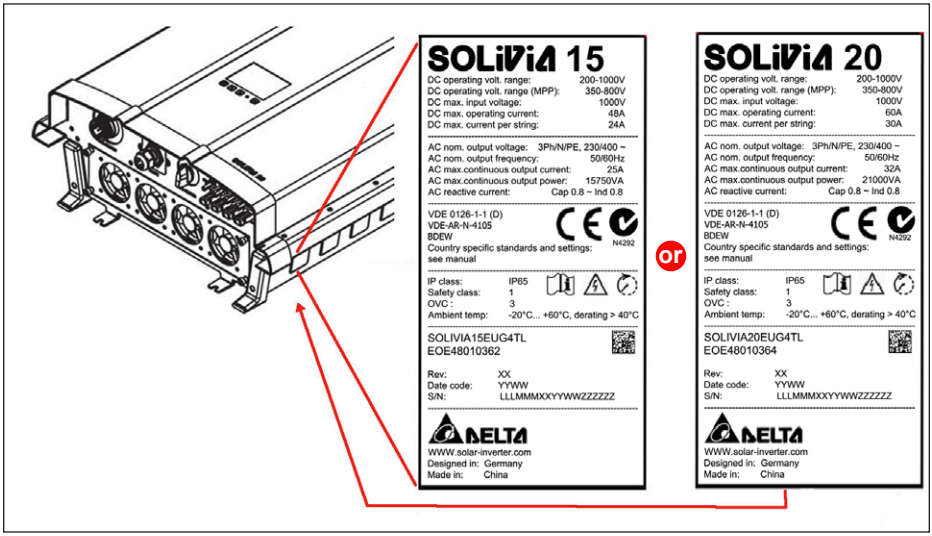
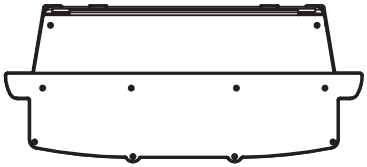


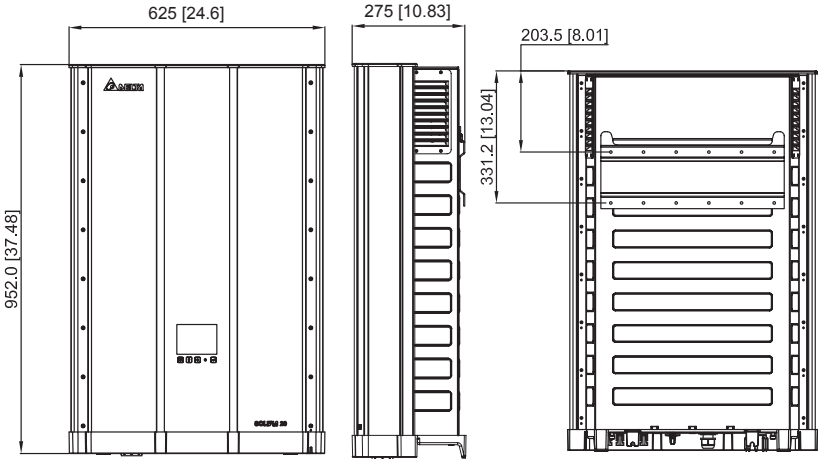
Figure 2.2.: The Type Label

3. Product Overview

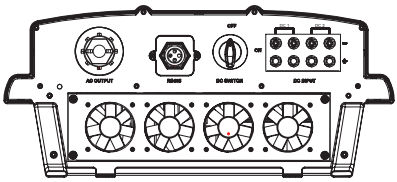
3.1 Dimension



Top view



Front view Side view Rear view



Bottom view

Figure 3.1.: Dimensions of SOLIVIA 15 TL / 20 TL

3.2 Function Introduction

Inverter exterior objects are shown on the figure 3-2, and the detail description is in the sections from 3.2.1 to 3.2.3

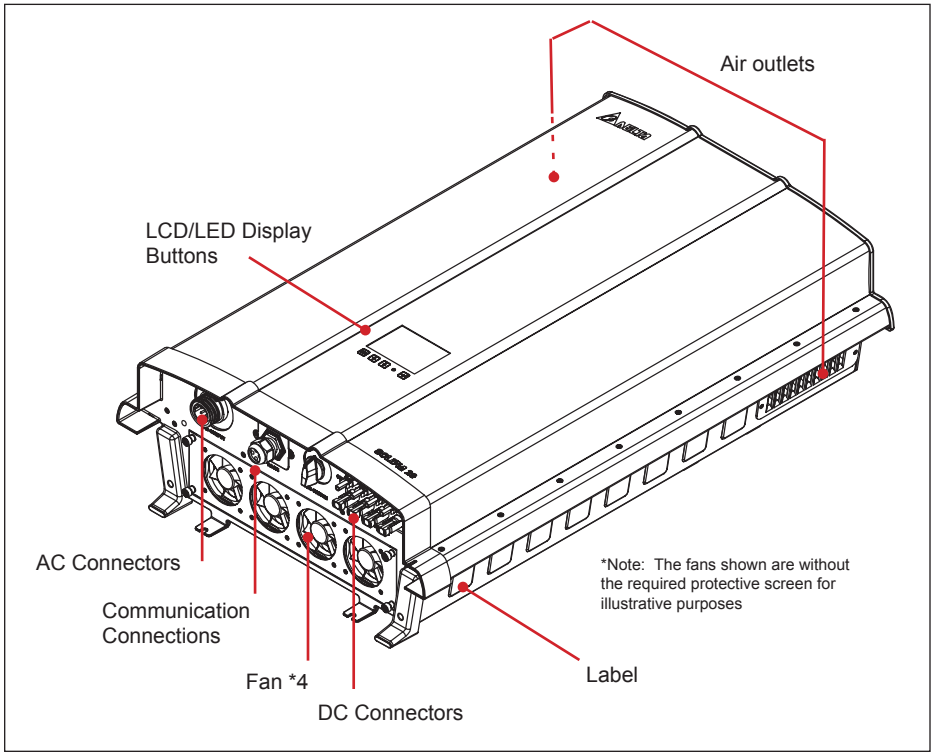


Figure 3.2.: Inverter Exterior View

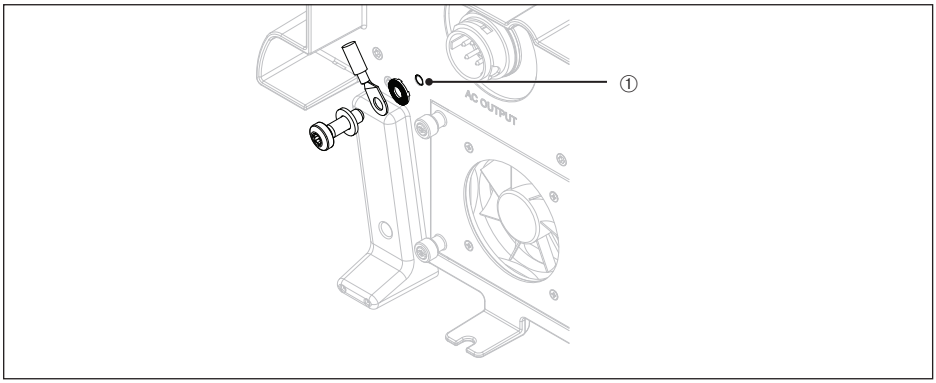


Figure 3.3.: Grounding Kit

The chassis has a predrilled hole ① to accept a grounding screw as shown. The maximum torque of the M6 grounding screw is 4.4 Nm. There is a 15 mm diameter unpainted surface around the center of the ground screw hole that allows for a solid ground connection when installing the grounding kit.

3.2.1 LCD Display and Buttons

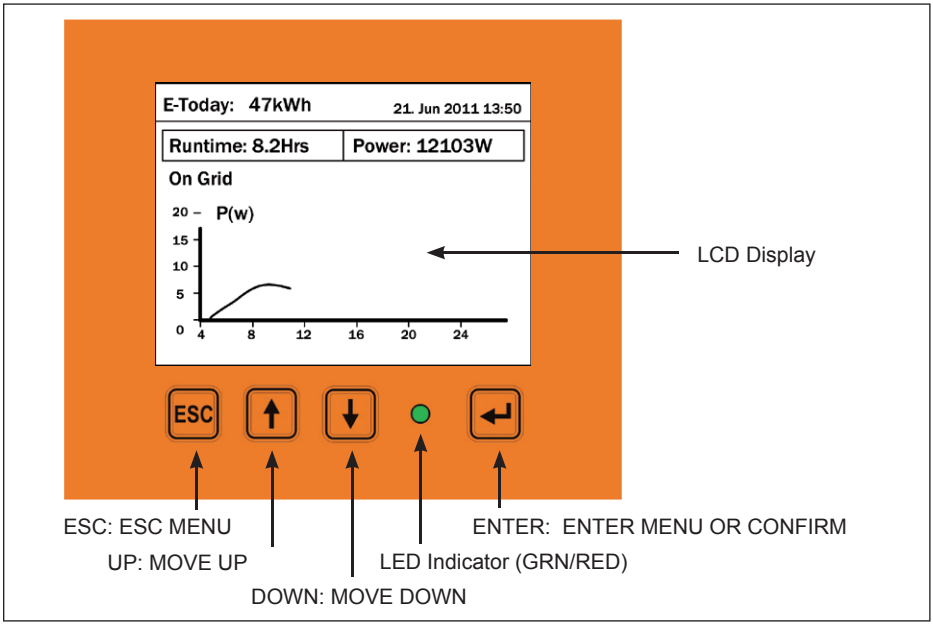


Figure 3.4.: LCD Display and Control Panel

3.2.2 Inverter Input/Output Interface

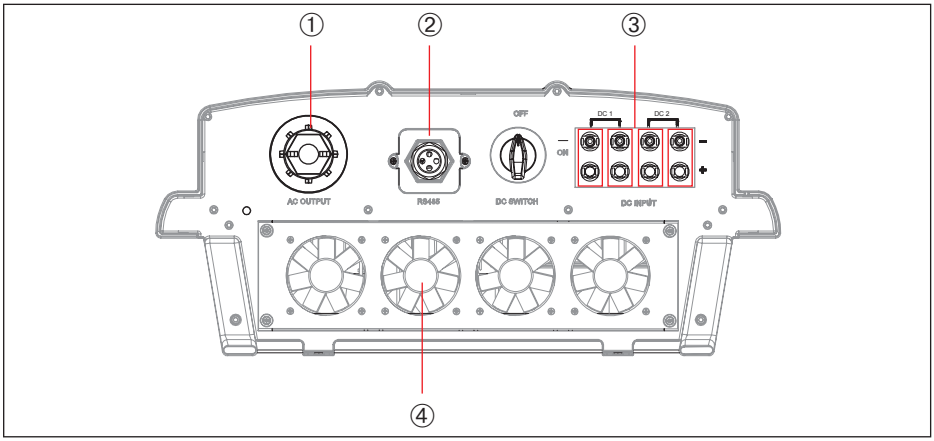


Figure 3.5.: Input/Output Interface

No.	Designation	Description
①	AC connector	400 V_{AC}
②	Communication	2 × RS485, 1 × EPO, 2 × Dry contact
③	DC connector	4 Strings
④	Fans	4 Fans

NOTE

The fans shown are without the required protective screen for illustrative purposes

3.2.3 Air outlet

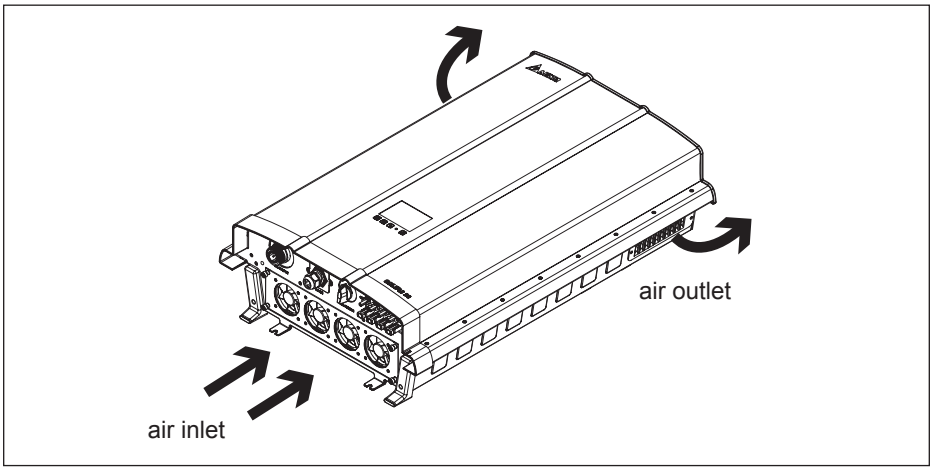


Figure 3.6.: Air Outlet Illustration

There are 4 fans in the bottom section of the inverter and all fans work synchronously. If any one fan locks up or is defective, it will cause a fan failure and power derating. If you suspect that there is a problem with a fan please call the Delta support hotline.

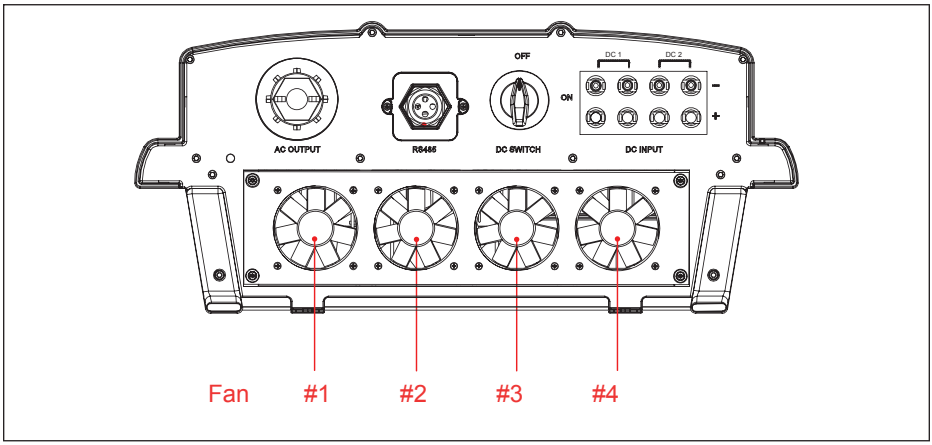


Figure 3.7.: Fan Control

4. Installation

4.1 Installing Location

The SOLIVIA 15 TL and 20 TL can be installed indoors and in protected outdoor areas due to its enclosure protection classes IP65 and IP55. See the figure below for further explanation of the protection classes.

WARNING

Death and serious injury may occur if the following instructions are not carefully followed

- ► Do not install the unit near/on flammable objects.
- ► Do not install the unit at a location that people can gain entry/touch easily.
- ► Mount the unit tightly onto a solid/ smooth wall.
- ► In order to ensure the safety of installers, there should be at least two people to handle the installation.
- ► When moving the SOLIVIA 15 TL and 20 TL, installer should not stand under material handling machines.

CAUTION

Machine and equipment damage may occur.

- ► Do not install the unit at a location that has direct exposure to sunlight.

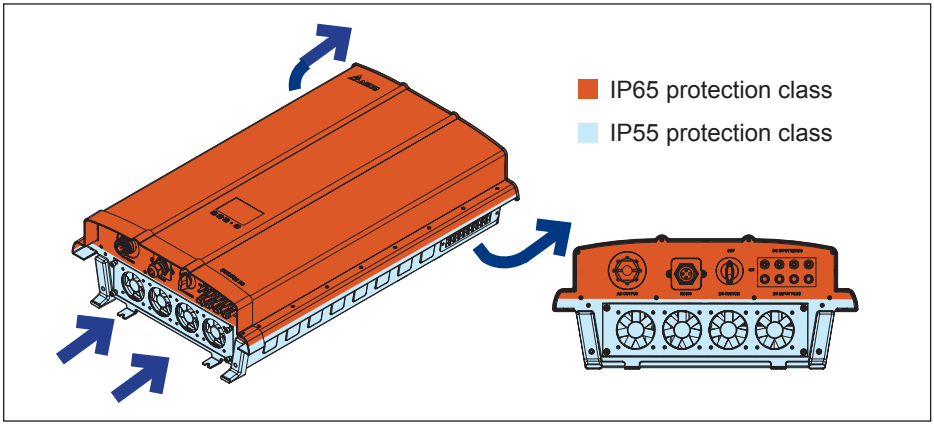


Figure 4.1.: SOLIVIA 15 TL and 20 TL protection classes

NOTE

The fans shown are without the required protective screen for illustrative purposes

The upper section of the inverter, shown in the darker tone above, is sealed from the lower section and rated at IP65 enclosure protection. The lower section of the inverter, containing the cooling mechanisms, is rated at IP55 enclosure protection.

4.2 Mounting

This unit utilizes a wall mounting system. Please ensure the installation is perpendicular and with the AC plug at the bottom. Do not install the device on a slanted wall. The dimensions of the mounting bracket are shown in the following figures. There are 12 pcs. of M6 screws required for attaching the mounting plate to the wall. Attach the mounting plate securely to the wall, before attaching the inverter on the mounting plate.

NOTE

Please ensure you are using the correct fastener for the material you are attaching the inverter mounting plate to.

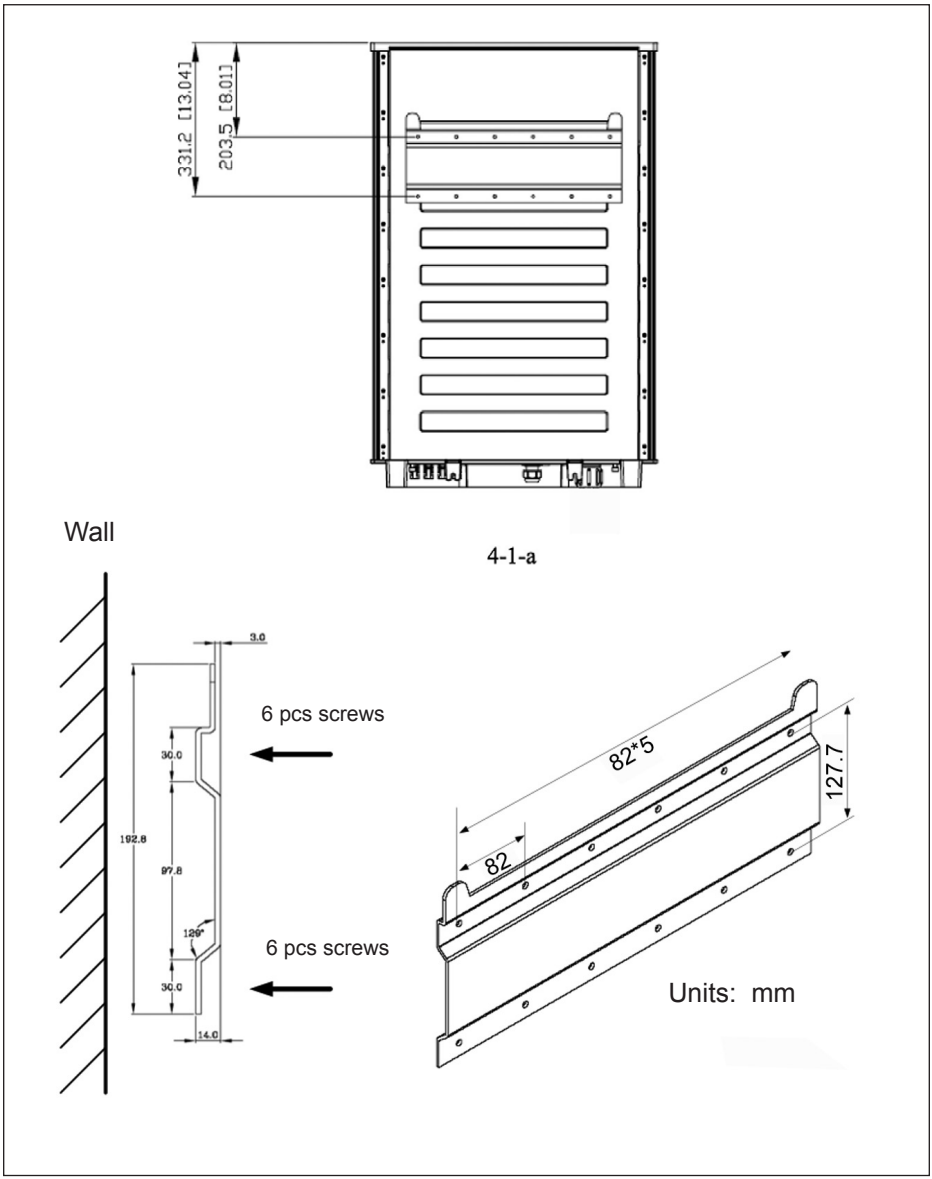


Figure 4.2.: Attaching the mounting bracket to the wall

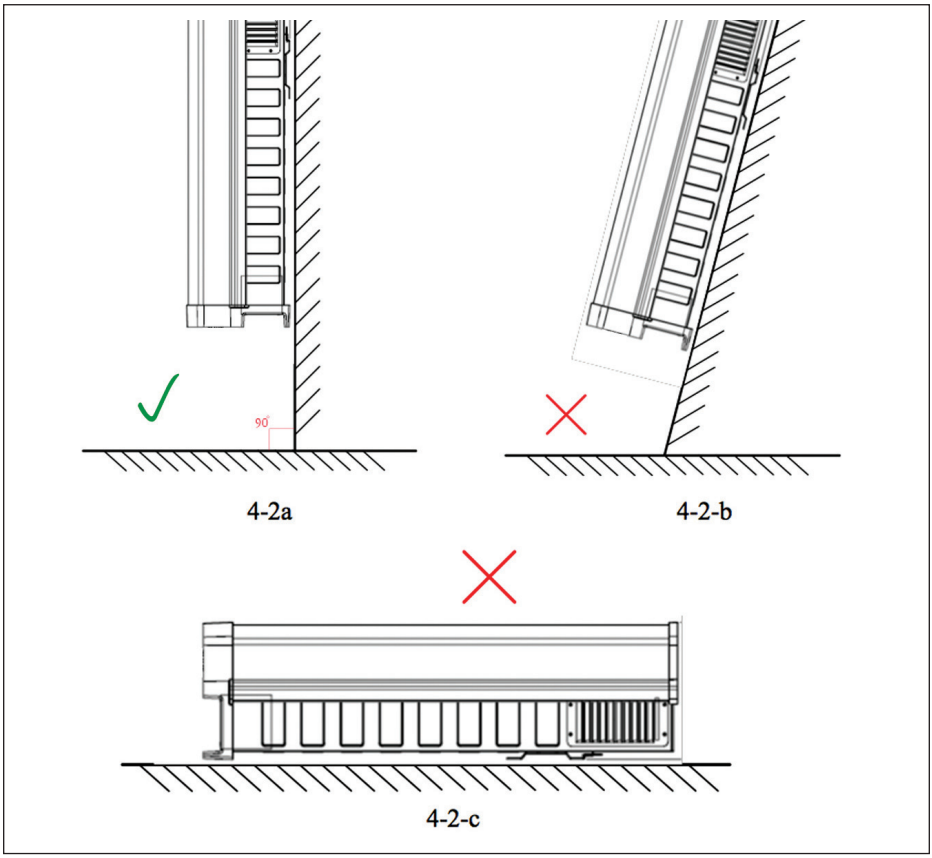


Figure 4.3.: Correct and Incorrect Installation Illustration

CAUTION

Machine and equipment damage may occur.

- ► Please leave an appropriate gap in between when installing single / several DELTA solar inverter systems.
- ► Please install solar inverters at eye level to allow easy observation for operation and parameter setting.
- ► Please install solar inverter in a clean and open space.
- ► The ambient temperature should be between -20°C - +60°C.

There should be sufficient space for product operation as shown in the figure 4-4. If necessary, the installer should increase the gap space for optimum product performance.

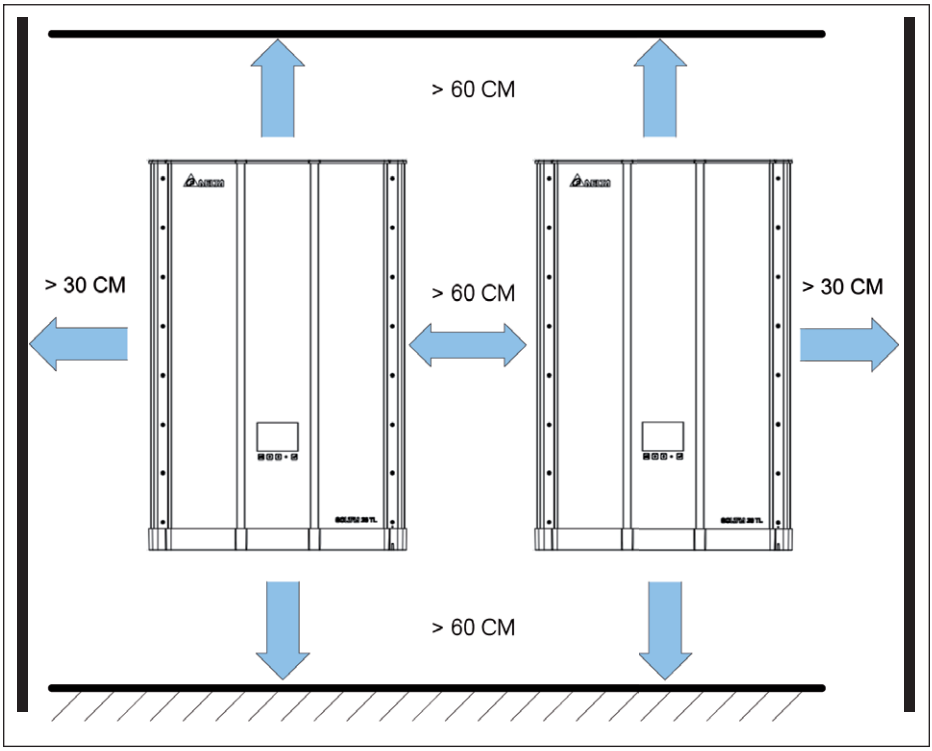


Figure 4.4.: Proper Installation Gap

4.3 Ambient temperature

The solar inverter can be operated in an ambient temperature between -20 °C ... +60 °C. The following diagram illustrates how the power supplied by the solar inverter is reduced automatically in accordance with the ambient temperature.

The device should be installed in a well-ventilated, cool and dry location.

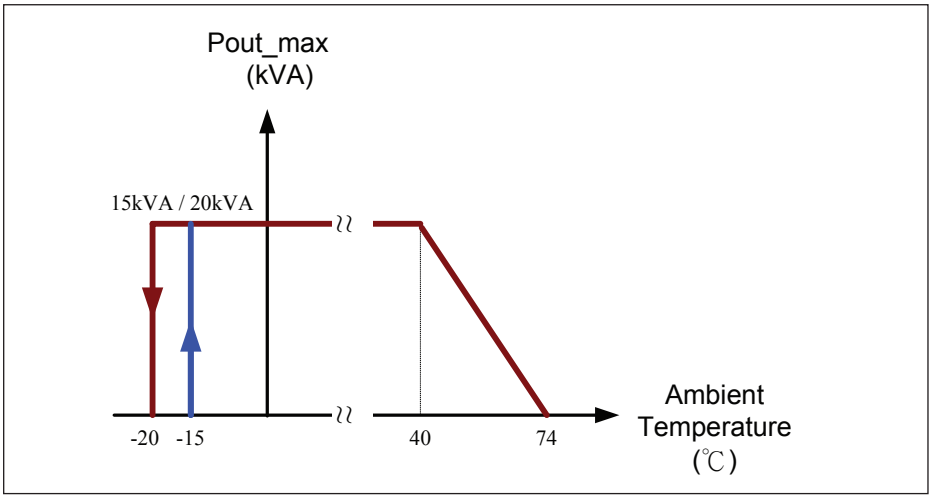


Figure 4.5.: Derating curve

5. Wiring the Inverter

5.1 Preparation before Wiring

1. To avoid accidents, please confirm that the PV inverter's power of both DC and AC are switched off.
2. Please confirm whether the input/output of PV inverter's wiring are clearly indicated. Make sure that the value, polarity, voltage and phase are correct.
3. The wiring procedure of a PV system is shown in figure 5-1 and 5-2. Wiring details are described in the following paragraphs.
   - When the DC input is floating, an external transformer is not necessary. Please refer to Figure 5-1 for the connection. The inverter can accept DC inputs in parallel (1 MPP tracker) or separate DC input connections (2 MPP Tracker).
   - Operating in parallel DC inputs (1 MPP Tracker)

Inverter MPPT:	Power sharing decided by each input's impedance
Boost MPPT:	>10 kW, inverter will force to balance the DC1 & DC2 power
	<10 kW, inverter will not force to balance the DC1 & DC2 power

   - Operating in separated DC inputs (2 MPP Trackers)

     The max. rating is 10.5kW/30A for each input.

CAUTION

Machine and equipment damage may occur.

► When the DC input is a positive ground or negative ground, all of the strings must be connected in parallel and then connected to the inverters. In addition, an external isolation transformer must be installed on the AC side, otherwise, damage will result and the inverter will not work properly. Different DC input wiring needs require different insulation detection settings. To learn more about the settings, please refer to „6.3.6.2 Install Settings“ on page 54.

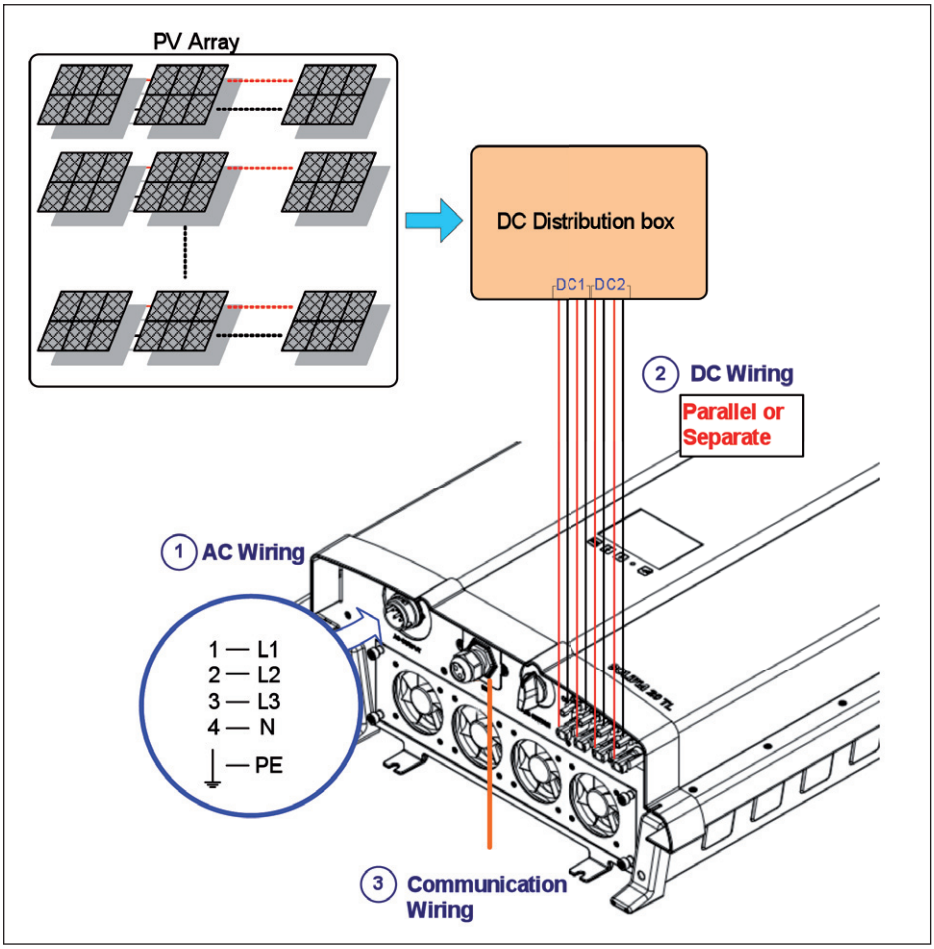


Figure 5.1.: Connection of system if DC inputs are floating

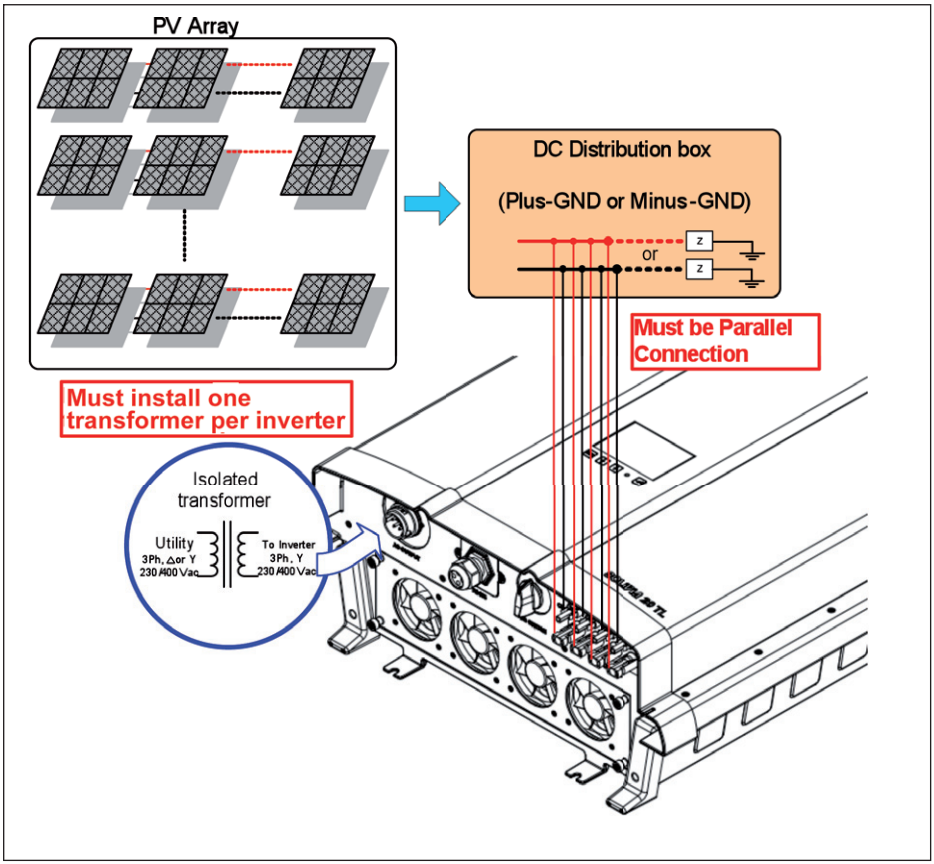


Figure 5.2.: Connection of system with Positive Ground or Negative Ground

5.2 AC Grid Connection: 3 Phase + N + PE

WARNING

Death and serious injury may occur

► Before engaging in the AC wiring, please ensure the AC 3-phase power is switched off.

Please use properly sized wire to connect to the correct poles (According to the table below)

Current Rating	Wire size	Torque
≤ 30 A	6mm² / 10 AWG	≥ 0.9 Nm (10 kg)

AC wiring can be separated into 3-phase (L1, L2, L3), N, and PE. The following earthing configurations are allowed. IT is not allowed. Please see the appendix for further explanation of these earthing systems.

TN-S	TN-C	TN-C-S	TT	IT
Yes	Yes	Yes	Yes	No

Table 5.1.: Permitted earthing systems

NOTE

TT ist not recommended. Have to besure the voltage of N is very close to PE (< 20 V_{rms})

In Figure 5.5, the Amphenol C16-3 AC connector shown can be mated with the inverter's AC plug. After disassembly of the connector, please adhere to the correct polarity for proper AC wiring (this product allows either positive or negative phase sequence). That means the sequence of L1-L3 can be adjusted and the N and PE must be connected.

5.2.1 AC bayonet connector

The AC bayonet connector is approved for cable sheath diameters between 11 mm and 20 mm. To install an AC cable, first strip the voltage free line and cable ends as shown below and then follow the sequence in Figure 5.5 to assemble the cable and bayonnet connector.

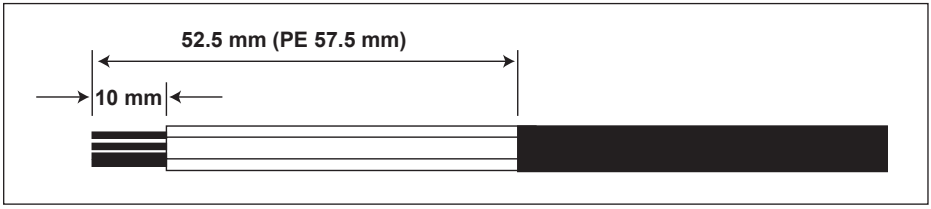
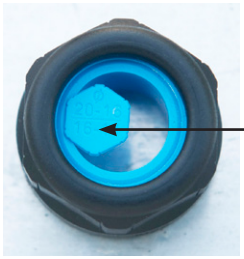


Figure 5.3.: AC cable stripping requirements

NOTE

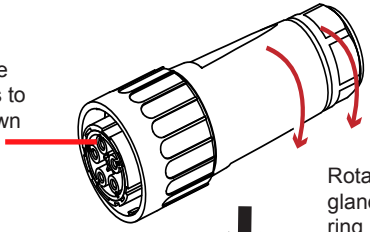
For lines with a cable sheath diameter from 16 mm to 20 mm, the cable gland must be adapted accordingly. To do this, cut out the inner section of the blue sealing ring.



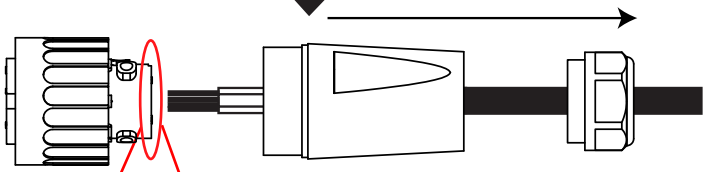
This is a rear view of the cable gland. For a cable sheath diameter between 16 mm to 20 mm, please remove the inner sealing ring.

Figure 5.4.: AC plug sealing ring

The female cable connector needs to be wired as shown below.

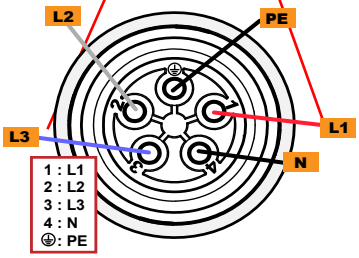


Rotate the connector housing and cable gland to remove them from the coupling ring.

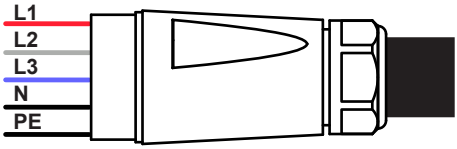


Slide the connector housing and cable gland onto the cable.

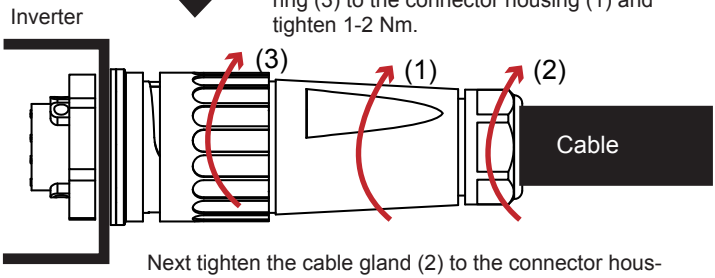
NOTE: Rear view of cable connector



To wire the connector refer to placement of L1, L2, L3, N and PE shown to the left. Screw termination is provided to fix the wires to the contacts.



After wiring the mating connector, screw the connector housing (1) to the coupling ring (3). To do this push the coupling ring (3) to the connector housing (1) and tighten 1-2 Nm.



Next tighten the cable gland (2) to the connector housing (1). Tightening torque for cable sheath diameters between 11 and 20 mm: 6 to 8 Nm. Rotate the coupling ring (3) to mate the connector with the inverter‘s AC plug.

Figure 5.5.: AC plug illustration

CAUTION

Machine and equipment damage may occur.

► Observe the pin assignment of the AC bayonet connector. An incorrect assignment can result in the unit being destroyed. The Figure 5.5 pin out diagram shows the connections inside the AC connector.

NOTE

Make sure the line is provided with a strain relief device. When using cables with a diameter of less than 13 mm (**11 mm ... 13 mm** diameter cable require strain relief), the cable must be relieved just behind the connector.

The connection to the Amphenol AC connector for both models can be made with a flexible or rigid cable with a copper conductor that has a cross section greater than 4.0 mm^2 and which has an installation condition that gives a correction factor equal to one. The AC cable should be protected by a minimum type B 40 Amp breaker.

This connector is developed for connection to copper wires (for other applications please contact Amphenol). The cross section of the cable should be calculated by considering the material used, thermal conditions, length of the cable, the type of installation, and AC voltage drop.

Please note the cable length and the cable cross-section, due to the risk of undesirable temperature rise and power losses. In some countries (e.g. France, Germany) system installation requirements have to be followed (UTE 15712-1, VDE 0100 712). This recommendation will define minimum cable sections and protections against overheating due to high currents. Please make sure that you follow specific requirements in your country.

For the security of your installation and for the safety of the user, please install required safety and protection devices that are applicable for your installation environment (example: automatic circuit breaker and/or overcurrent protection equipment).

WARNING

Death and serious injury may occur

In the case of damage or bodily harm resulting from the use of this device in a way contrary to it's intended purpose or as a result of unauthorized modifications made to the parameters of the inverter, Delta will not be held liable in these situations..

The solar inverter must be grounded via the AC connector's PE conductor. To do this, connect the PE conductor to the designated terminal.

The AC connector is protected from unintentional disconnection by a clip mechanism which can be released with a screwdriver.

The AC voltage should be as follows:

- L1-N: 230 V_{AC}
- L2-N: 230 V_{AC}
- L3-N: 230 V_{AC}

5.3 DC Connection (from PV array)

WARNING

Death and serious injury may occur

► When doing DC wiring, please ensure the wiring is connected with the correct polarity.

► When doing DC wiring, please confirm that PV array's power switch is off.

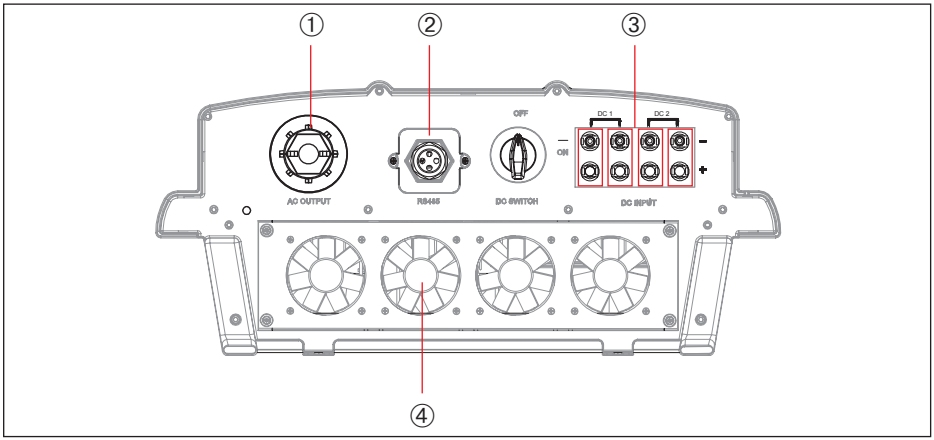


Figure 5.6.: Input/Output Interface

No.	Designation	Description
①	AC connector	400 V_{AC}
②	Communication	2 × RS485, 1 × EPO, 2 × Dry contact
③	DC connector	4 Strings
④	Fans	4 Fans

NOTE

The fans shown are without the required protective screen for illustrative purposes

CAUTION

Machine and equipment damage may occur.

- ► The connection number of PV ARRAY, open circuit voltage and power of String_1 and String _2 must be coherent.
- ► The connection number of PV ARRAY, open circuit voltage and power of String _3 and String _4 must be coherent.
- ► The maximum power connected to the 15 TL may not exceed 10 kWp per input or 19 kWp in total.
- ► The maximum power connected to the 20 TL may not exceed 13 kWp per input or 25 kWp in total.
- ► The maximum open circuit voltage of PV Array must not exceed 1000 V.
- ► The range of V_{mpp} of Input DC1 and Input DC2 shall be 350~800 V_{DC}.
- ► The device installed between PV array and inverter must meet the rating of voltage <1000 V_{DC} and < short current.

Cable size:

Current rating	Wire size
DC 30 A	6 mm² / 10 AWG

DC wiring polarity is divided into positive and negative, which is shown in figure 5-6. The connection should be consistent with the indicated polarity marked on the inverter.

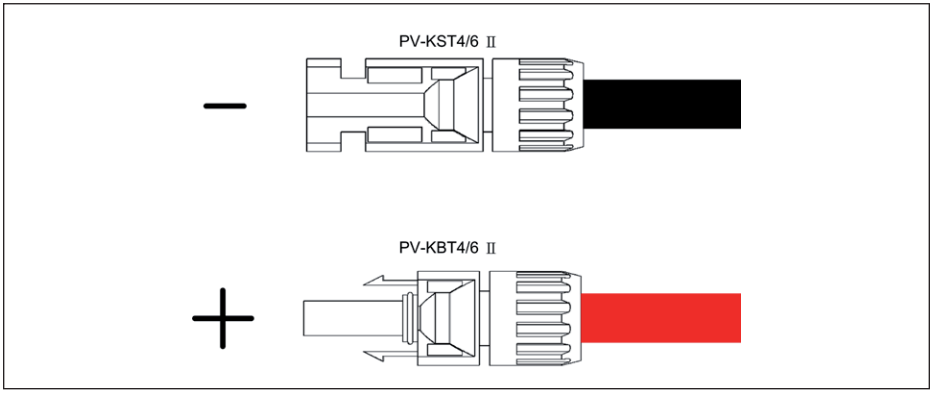


Figure 5.7.: DC Wiring Illustration

A kit to meet UTE 15712-1 requirements is provided for the SOLIVIA 15 TL and 20 TL and can be ordered from Delta with the part number in the following table.

	Designation	Part number Delta
	UTE kit Multi-Contact	EOE90000341

5.4 5.4 Efficiency

The best efficiency of the solar inverter is obtained at an input voltage of 640 V.

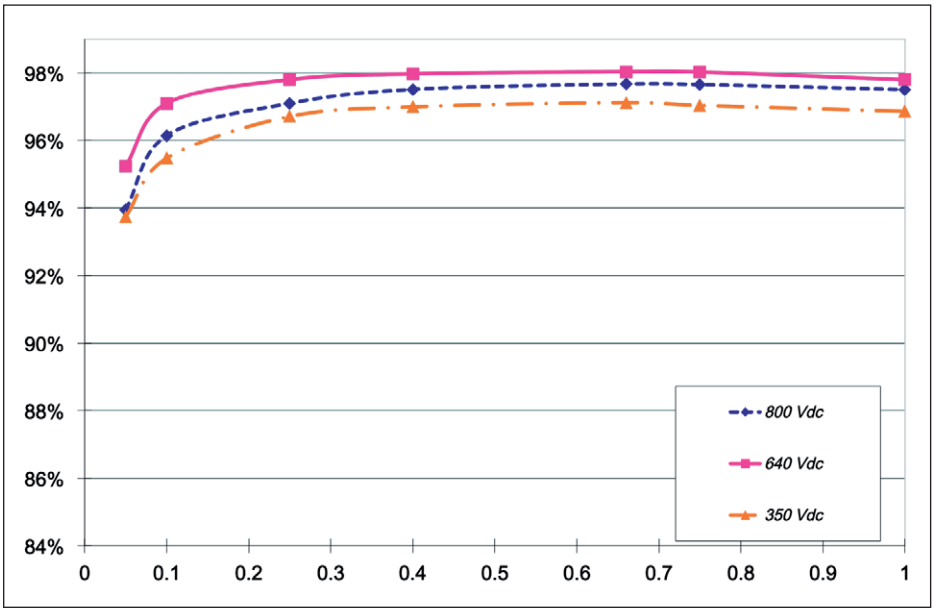


Figure 5.8.: SOLIVIA 15 TL Efficiency Curve

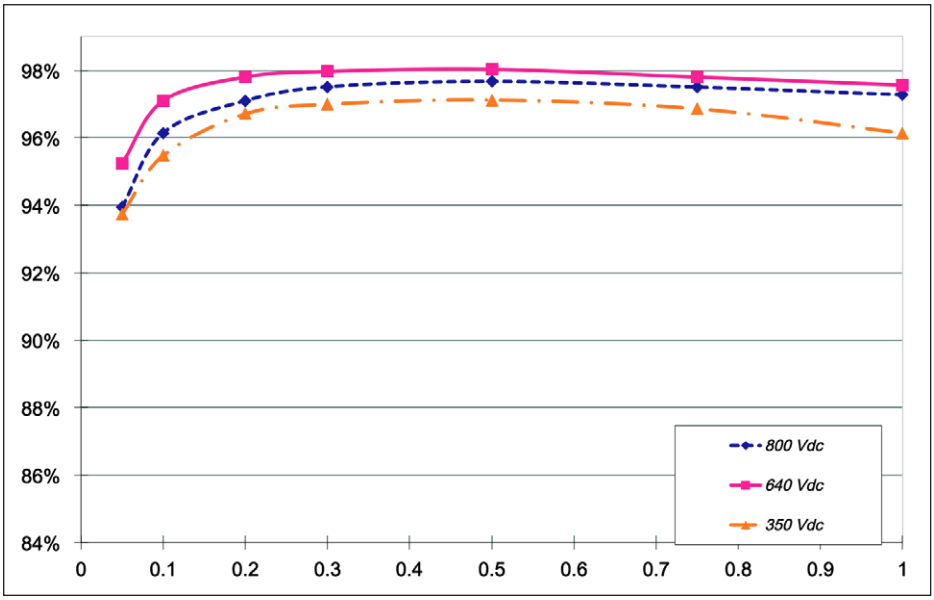


Figure 5.9.: SOLIVIA 20 TL Efficiency Curve

5.5 Communication Module Connections

The communication module supports the communication functions with a computer, also provides 1 EPO (Emergency Power Off) and 2 sets of dry contacts. The parts of the communication module are shown in Figure 5.10. The function of each part is detailed in sections 5.5.1 ... 5.5.3.

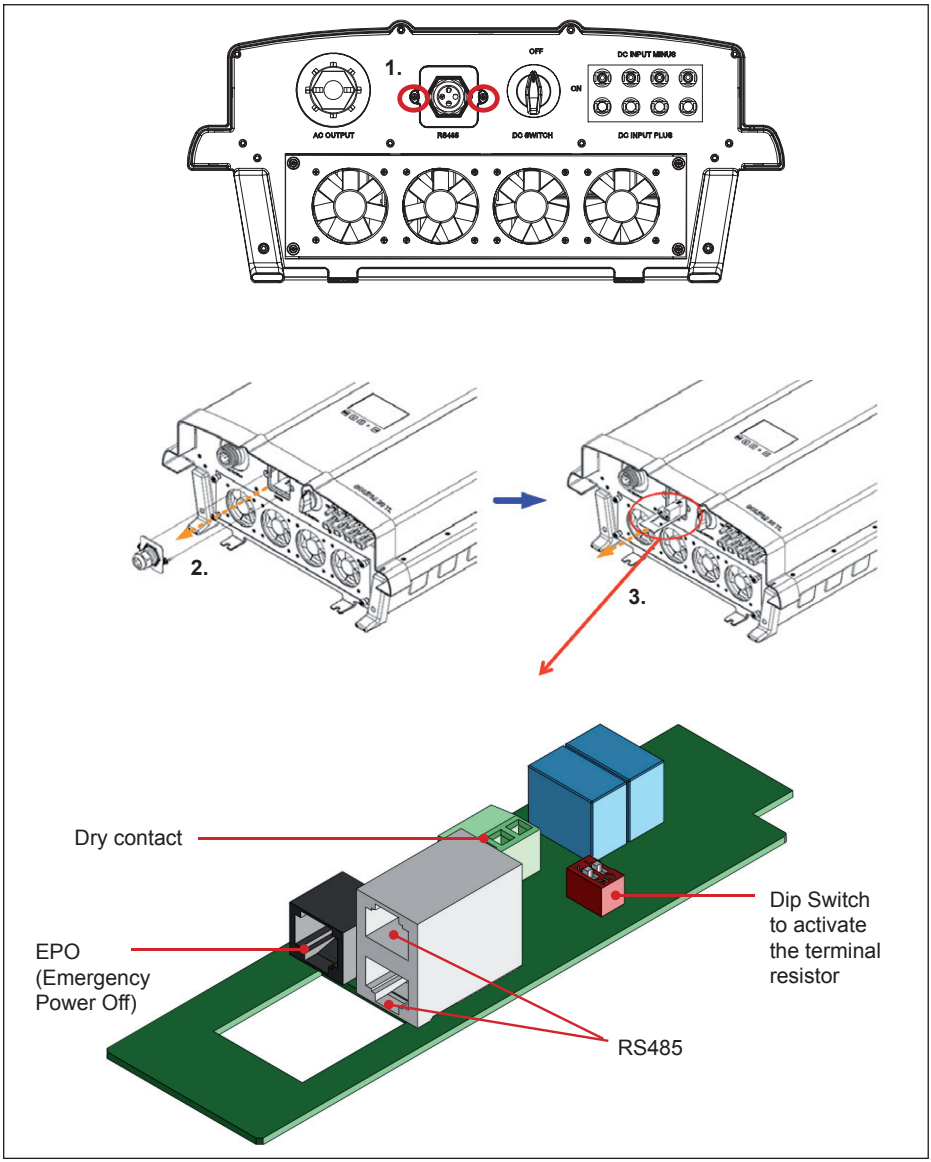


Figure 5.10.: Communication module removal

To remove the communication module follow these instructions:

1. Unscrew and remove the two Phillips screws highlighted in red in Figure 5.10.
2. Remove the front plate as shown.
3. Carefully pull out the communication module from the inverter. Remove glands and plugs where applicable.

5.5.1 RS485 Connection

The pin definition of RS485 is shown in Table 5.2. The wiring of multi-inverter connections is shown in Figure 5.11.

PIN	FUNCTION
4	GND
7	DATA+
8	DATA-

Table 5.2.: Definition of RS485 pin

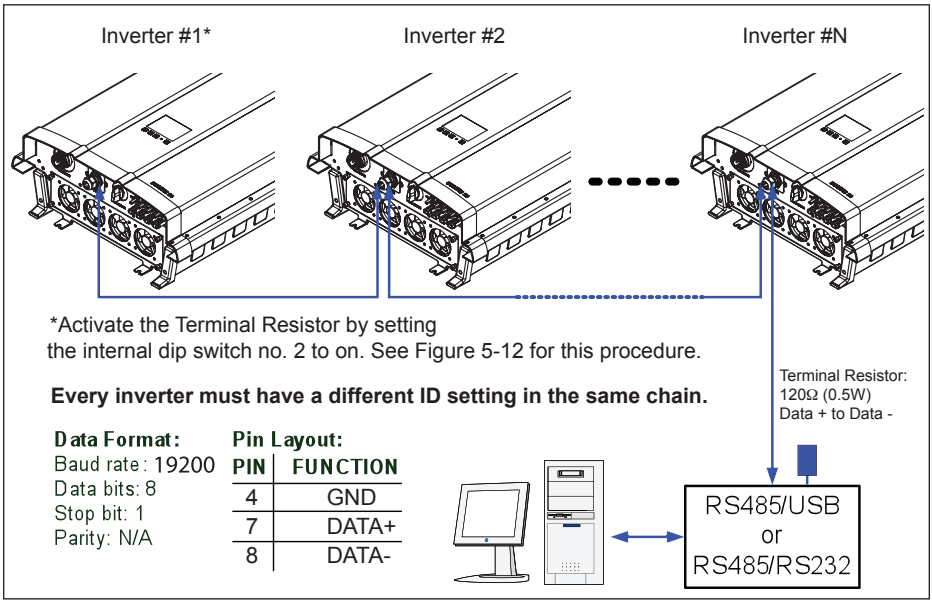


Figure 5.11.: Multi-inverter Connection Illustration

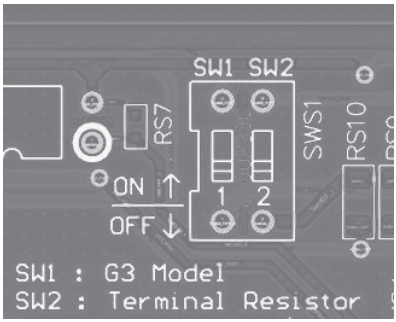


Figure 5.12.: Terminal Resistor Switch for Multi-inverter Connection

To engage the internal Terminal Resistor, place switch number 2 on the communication module in the on position.

Baud Rate	Programmable, 2400/4800/9600/19200/38400, default = 19200
Data Bit	8
Stop Bit	1
Parity	N/A

Table 5.3.: RS485 Data Format

5.5.2 EPO (Emergency Power Off) Connections

The SOLIVIA 15 TL and 20 TL provides emergency power off functions by using an RJ45 connector. When the outer external switch is shorted, the inverter will shut down immediately. Please see Table 5.4 for the pin definition.

PIN	Definition
1	EPO1
2	EPO1
3	N/A
4	EPO2
5	EPO2
6	N/A
7	N/A
8	N/A

Table 5.4.: EPO pin assignment

NOTE

To shutdown the inverter, short pin 1 and 2 or short pin 4 and 5.

5.5.3 Dry Contact Connection

Provides 2 sets of Dry Contact function - NO1 and NO2. Please refer to Figure 5.11 for connection diagram and read below for more details.

NO1: When the inverter is on the grid, the COM and NO1 will be shorted.

NO2: When the fan fails, COM and NO2 will be shorted.

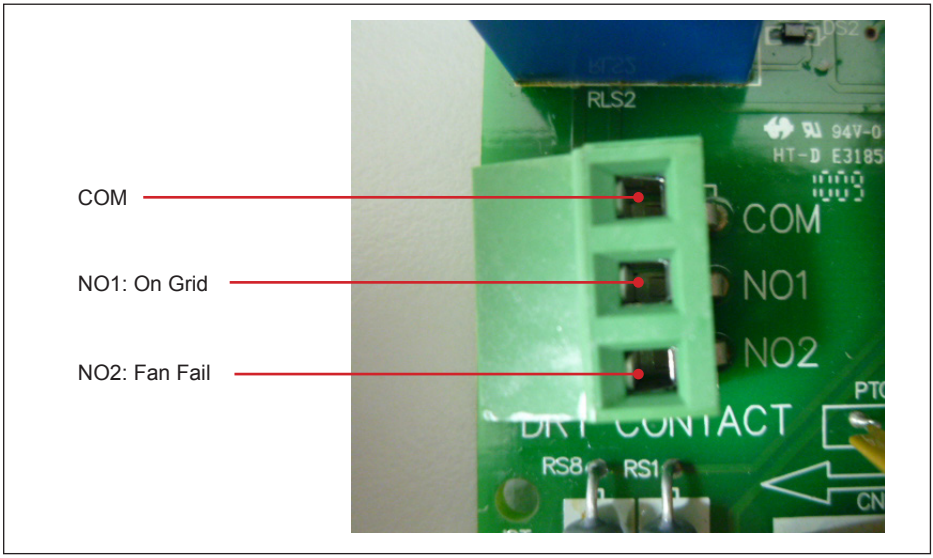


Figure 5.13.: Dry contact connection

6. Operating the PV inverter

WARNING

Burn hazard!
The enclosure temperature may exceed 70° C while in operation. Injury may occur owing to the hot surface.
► Please do not touch!

After installation, please confirm the AC, DC, and Communication connections are correct. Follow the steps below to startup the inverter:

1. Check the PV array DC voltage:
   - Uncover the PV arrays and expose them to full sunlight.
   - Measure the PV array open circuit DC voltage across the DC positive (+) and negative (-) terminals in the DC distribution box. This voltage must be greater than 250 V_{DC} and less than 1000 V_{DC}.
2. Check the AC utility voltage:
   - Using an AC voltmeter to measure the AC utility voltage and ensure the voltage is at approximately the nominal value (Nominal = 230 Vac Line-N).
3. Set all necessary settings:
   - Switch on AC breaker to provide power to the inverter (40 seconds)
   - Check the inverter display.
   - Country & Language settings appear on the display at first startup.

NOTE

Countries supported: Belgium, France, Italy, Netherlands, Spain, Greece, Germany, Czech Republic, Slovakia, Portugal, Bulgaria, Romania, United Kingdom, Australia

Language supported: English, Italian, French, German, Dutch & Spanish

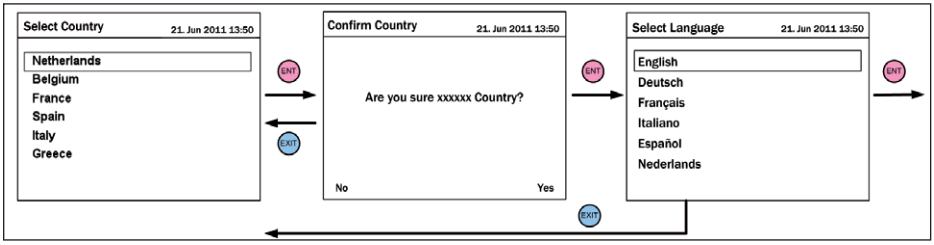


Figure 6.1.: Country Settings on initial startup

– Set all settings for Date, Time, Inverter ID, Insulation, etc.

NOTE

► If selecting **Germany or Italy** as the country, it could be necessary to adjust active and reactive power settings (Information for the settings will come from the local grid operator).

► If needed please call the local support hotline for assistance in setting up Germany MVD/LVD or Italy CEI 0-21/A70 grid settings.

4. Start up the inverter:

– After finishing the basic settings, turn on DC switches (including the DC switch in inverter), inverter will do some self-tests and start a countdown if there is no problem.

– When operating, check all information on the display is correct (ex. Input voltage, current and power; output voltage, current, power and frequency)

When solar irradiation is sufficient, the device will operate automatically, after the self-auto test is completed successfully (about 2 minutes on the first startup of a day). Please refer to Figure 6.2 showing the LCD Display and Control Panel details. The display includes a 5“ graphic LCD with 320x240 dots of resolution and a LED indicator showing inverter status. There are green and red colored LED indicator lights to represent various inverter states of operation. Please refer to Table 6-1 for more detail on the LED indicator.

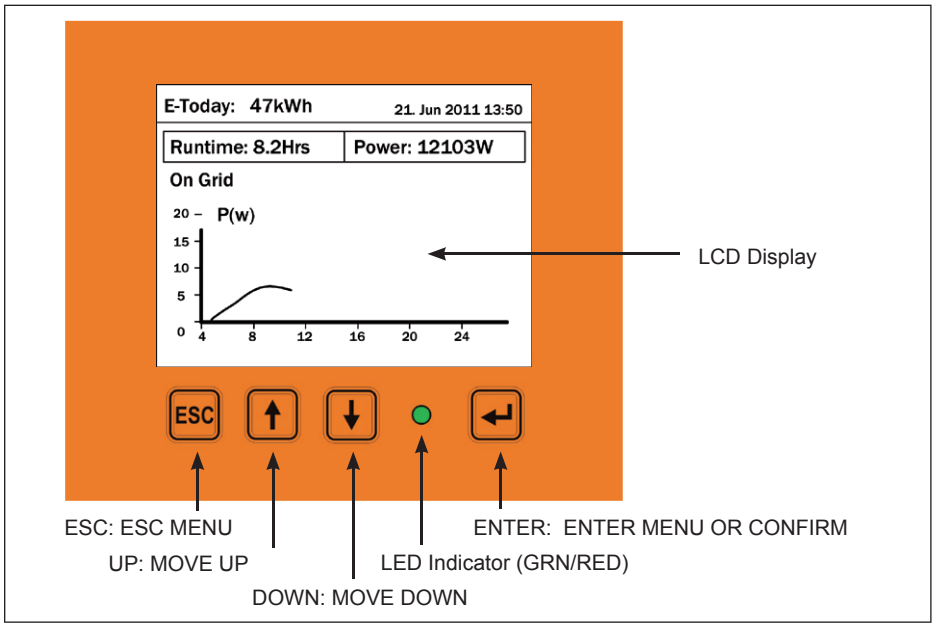


Figure 6.2.: LCD Display and Control Panel

Inverter Status	Green LED	Red LED
Standby or Countdown	FLASHING - on 1 sec. and off 1 sec.	OFF
Power ON	ON	OFF
Error or Fault	OFF	ON
Night time (No DC)	OFF	OFF
Bootloader mode	FLASHING - on 1 sec. and off 1 sec., first the green LED then the red LED in alternating sequence	

Table 6.1.: LED indicator

6.1 Disconnection Parameter Settings

6.1.1 Power Disconnection Device (PDD) Settings

This applies to LVD and MVD settings when selecting the grid as DE LVD or DE MVD.

NOTE

DE LVD refers to Germany Low Voltage Directive and DE MVD refers to Germany Midvoltage Directive.

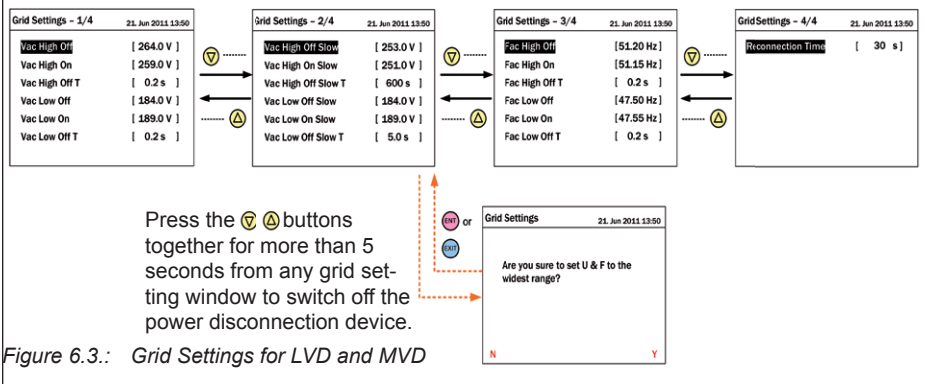


Figure 6.3.: Grid Settings for LVD and MVD

The grid settings for Germany LVD and MVD can be tuned according to the local utility requirements. The integrated power disconnection device can be set in three modes: 1) set to default values as recommended by LVD/MVD regulations, or 2) adjustments can be done manually within the allowed parameter ranges according to the LVD/MVD regulations depending on the selected mode, or 3) the device can be switched off.

At any time, while you are viewing one of the 4 grid setting windows, you are able to switch off the power disconnection device by simultaneously pressing the up and down buttons and holding for more than 5 seconds.

See the tables below for the LVD/MVD allowed parameter ranges according to the regulations:

When the selected grid is LVD, the following adjustable vaules are allowed:

Parameter	Name in display	Adjustable values
Rise-in-voltage protection U>	Umax	110 ... 115%

As defined in VDE AR N 4105, only the rise-in-voltage protection Umax shall be designed as 10-minute running mean value protection which prevents the upper voltage limit specified in DIN EN 50160 from being exceeded (monitoring over the power).

When the selected grid is MVD, the following adjustable values are allowed:

Parameter	Name in display	Adjustable values	Recommended by MVD
Rise-in-voltage protection U>>	Crit. Umax	1.00 ... 1.30 U_n	1.20 U_{ns}
Under-voltage protection U<	Umin	0.10 ... 1.00 U_n	0.80 U_{ns}
Under-voltage protection U<<	Crit. Umin	0.10 ... 1.00 U_n	0.45 U_{ns}
Rise-in-frequency protection f>	Fmax	50.0 ... 52.0 Hz	51.5 Hz
Under-frequency protection f>	Fmin	47.5 ... 50 Hz	47.5
Delay time for U<	tUmin	1.5 ... 2.4 s	1.5 ... 2.4 s

6.1.2 SPI device

The SPI is a system interface protection device for use in Italy. There is no internal SPI required for this inverter but an external SPI device may be requested. Care must be taken so disconnection settings on the inverter are set so they do not interfer with external SPI device disconnection settings. The password “5555” entered in the Install Settings page when Italy is selected as the Country, enables disconnection parameters to be adjusted directly within the grid settings menu.

6.2 Home Page

When the inverter is operating normally, the LCD will show the home page as shown in Figure 6.4. On the home page the user can find the output power, inverter status, E-today, date and time.

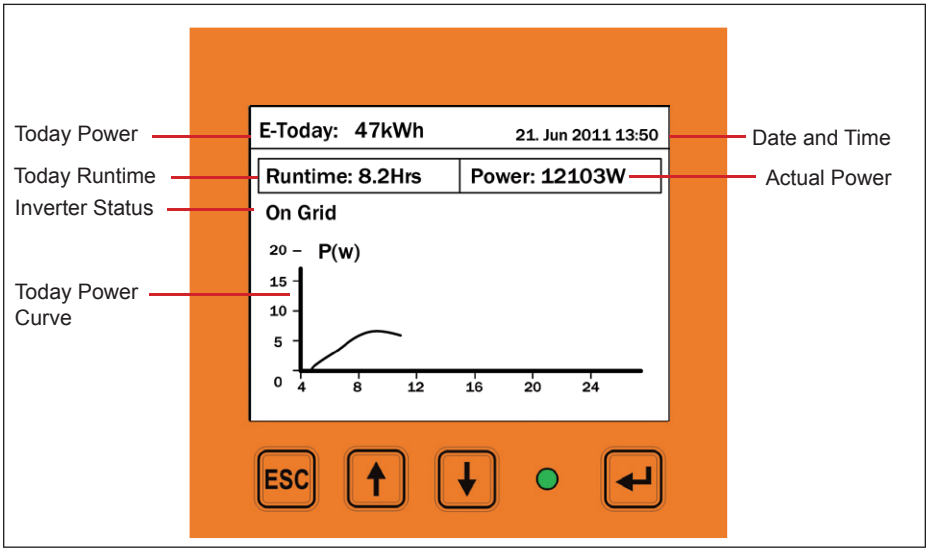


Figure 6.4.: Home page

6.3 LCD Flow Chart

Press any button to enter the menu page, the selections are shown in Figure 6.5. E-today is on the home page; the content of the rest of the pages will be explained in detail from 6.3.1 ... 6.3.6.

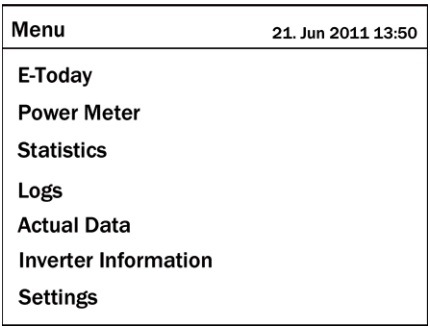


Figure 6.5.: Main menu page

6.3.1 Power Meter

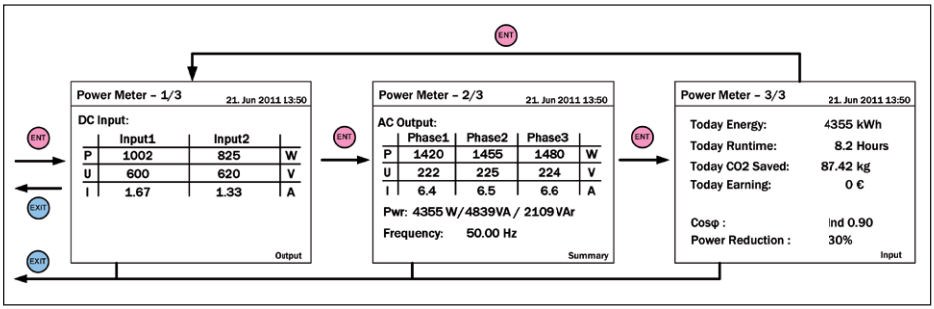


Figure 6.6.: Power Meter Pages

6.3.2 Statistics

After pressing **ENT** on this page, the user can view the historical data about power generation on a yearly, monthly and daily basis.

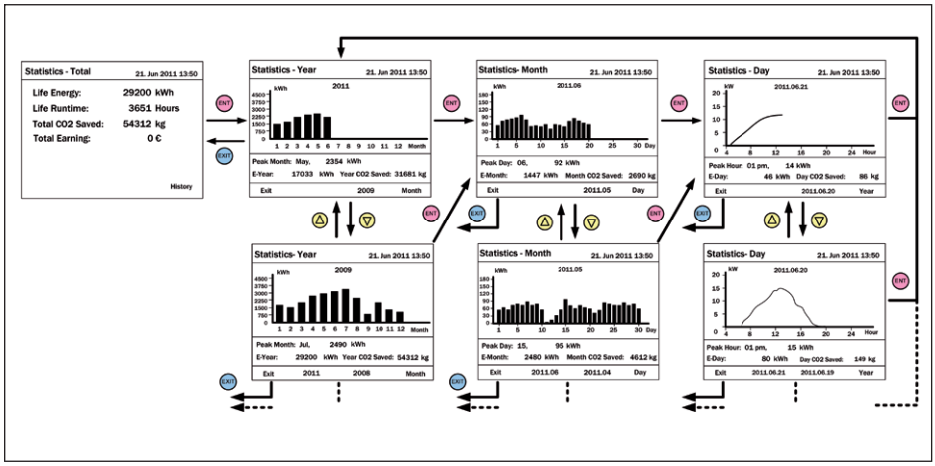


Figure 6.7.: Statistics Pages

6.3.3 Logs

After pressing **ENT** on this page, the user can view the internal log and can view the events log.

6.3.3.1 Internal Data

The internal data shows all messages coming from the inverter. These messages indicate the status of internal processes and also changes on the AC and DC terminals, for example: frequency, voltage, etc.

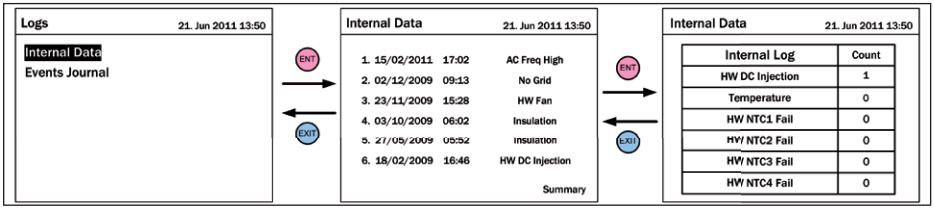


Figure 6.8.: Internal Data Flow Chart

6.3.3.2 Events Journal

The events journal records all events coming through the RS485 link or made on the display at the user level. Only events that could affect global production are shown in this log.

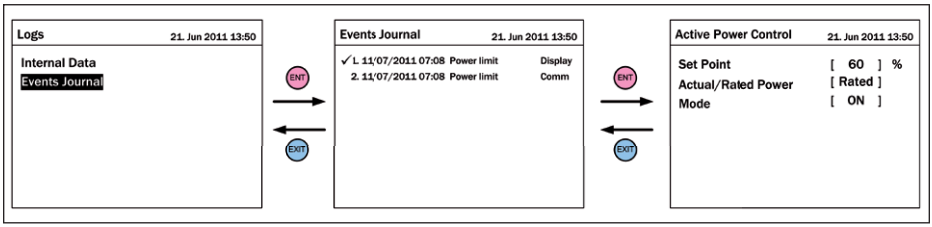


Figure 6.9.: Events Journal Flow Chart

6.3.4 Actual data

Actual data includes 4 pages and records the maximum and/or minimum historical values, including voltage, current, power and temperature.

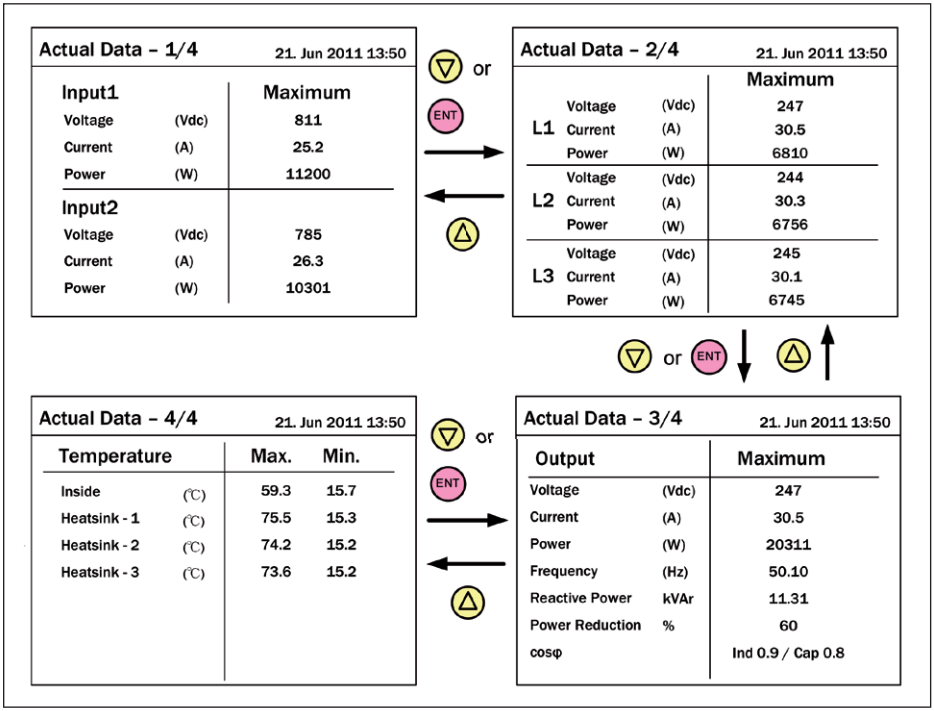


Figure 6.10.: Actual Data Flow Chart

6.3.5 Inverter Information

This page includes the following information: serial number, firmware version, installation date, and inverter ID. To change the inverter ID, please refer to "„6.3.6.2 Install Settings" on page 52.

Inverter Information	21. Jun 2011 13:50
Serial Number	0946000006
DSP-Version	1.80
Red.-Version	1.17
Comm.-Version	1.16
Installation Date	05.Jan.2009
Inverter ID	001
Baudrate	19200
IT-Grid Version TN	0.10

Figure 6.11.: Inverter Information Page

NOTE

The information shown in Figure 6.11 is for illustration purposes and may not match the actual information displayed on your inverter.

The last menu item is the Italian Software Version only applicable for installations in Italy.

6.3.6 Settings

Settings includes General Settings, Install Settings, and Active/Reactive Power Control.

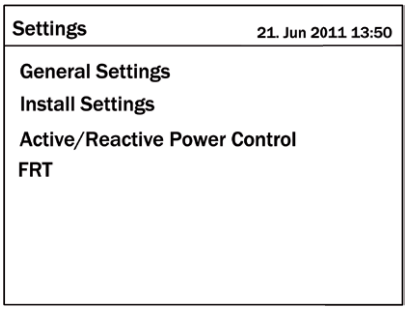


Figure 6.12.: Settings Page

NOTE

FRT is only accessible if you have selected Germany MVD, Italy CEI 021 or Italy A70 as your grid selection.

6.3.6.1 General Settings

Settings in the General Settings include Language, Date, Time, Screen Saver, Brightness, Contrast, Baud Rate, CO2 saved, Earning Value, and Currency.

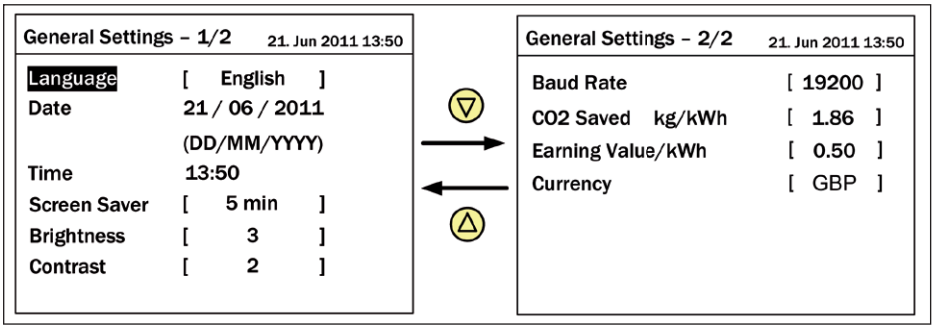


Figure 6.13.: General Settings Page

User can set the Language, Date, Time, Screen Saver, LCD Brightness, and Contrast appear on the General Settings page 1. Screen Saver can be adjusted from 5 minutes to 60 minutes. When over the setting time limitation, without the pressing of any buttons, the LCD backlight will go off automatically. Brightness and contrast can be adjusted from 1-5 levels (low to high). On General Settings page 2 the Baud Rate, CO2 Saved, Earning Value and Currency are adjustable. Currency is selectable as Australian Dollar (AUD), Euro (EUR) and Great Britian Pound (GBP).

6.3.6.2 Install Settings

Correct passwords are requested when entering Install Settings. Install Settings for user and installation technicians are different. The password can not be revised. After confirmation of the installer password (5555), user can set Inverter ID and Insulation settings. Country is viewable but not adjustable.

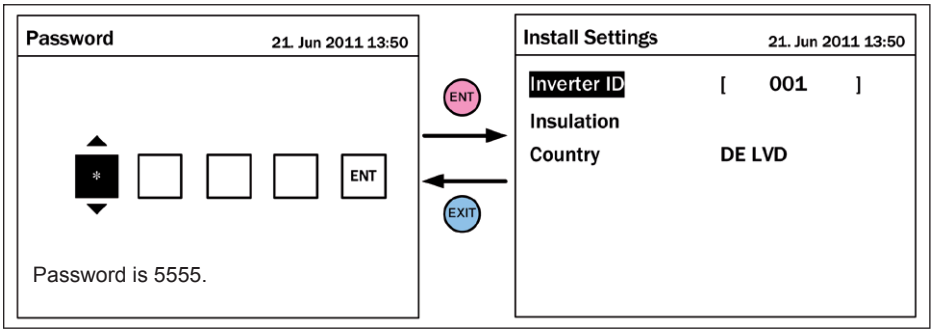


Figure 6.14.: Install Settings Page - Installer Mode

- **Inverter ID:** This setting is used to set unique ID's for installations with more than one inverter. In a multi-inverter installation where the inverters will be in a network, each inverter must have a unique ID.
- **Insulation:** ON means enable the measurement of impedance between Array and PE, will not connect to Grid if failure. Depending on DC wiring conditions, user can set 6 kind of insulation detecting method - ON, Positive Ground, Negative Ground, DC1 only, DC2 Only, or Disable. Installer can select different resistance criteria according the actual conditions.
- **Country:** This is the Country selected during startup (nonadjustable).

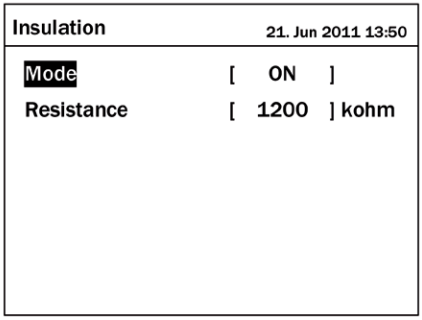


Figure 6.15.: Insulation Settings - Installer Mode

6.3.6.3 Active/Reactive Power control for DE LVD and DE MVD

Below is an overview of the features that are adjustable to control the production of active and reactive power for Germany LVD and MVD

Feature	Available for		Description
	LVD	MVD	
Active power control			

Feature	Available for		Description
	LVD	MVD	
Power limit	x	x	To reduce the maximum power production
Power vs. frequency	x	x	To set the power gradiant in dependency of the frequency
Reactive power control			
Constant cos φ	x	x	To set a fixed cos φ (inductive or capacative)
cos φ (p)	x	x	To set a cos φ (inductive or capacative) in dependency of the active power ratio P/P_n
Constant reactive power		x	To set the reactive power ratio Q/S_n. For MVD grids only.
Q (V)		x	To set the reactive power ratio Q/S_n in dependency of the voltage V. For MVD grids only.

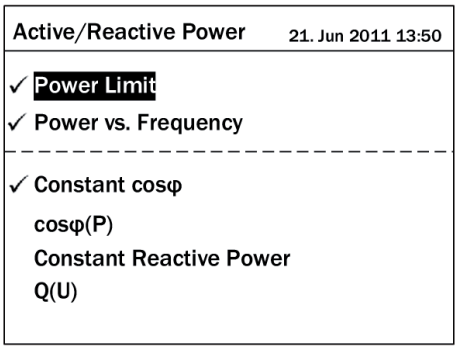
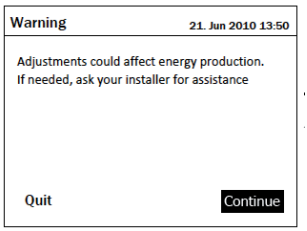


Figure 6.16.: Active/Reactive Power settings page



Note: Before adjusting the Active/Reactive Power settings, a Warning window will be displayed, that you should read and make a selection to continue or to quit. Please see caution messages below related to adjusting the settings.

CAUTION

Machine and equipment damage may occur.

- ► Please only adjust active and reactive power settings if you are a qualified electrical technician with the knowledge to do so
- ► Adjustments may affect energy production
- ► Some values entered in the Active/Reactive Power settings must come from the local grid operator. Please check with them before making any adjustments

6.3.6.3.1 Power Limit

User can select set percentage of actual or rated power to limit inverter's output power. Inverter will start the action once the user sets the Mode to "ON". This feature is available for LVD and MVD grids.

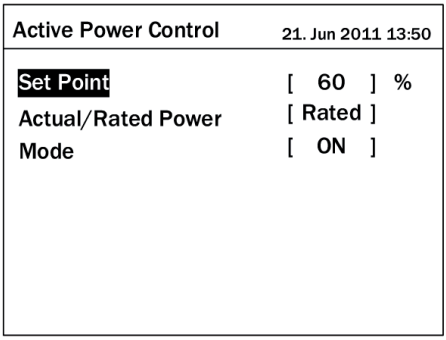


Figure 6.17.: Power Limit settings page

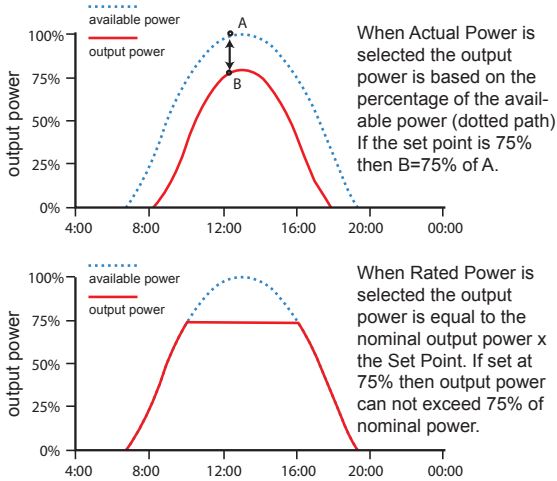


Figure 6.18.: Actual Power vs Rated Power

Parameter	Adjustable Values	Description
Set point	0 ... 100%	Sets the power reduction to the adjusted value. The value is multiplied with the value of the Locked power limitation.
Actual/Rated	Actual | Rated	Select Actual or Rated Power
Mode	ON | OFF	Switches the feature on and off.

6.3.6.3.2 Power vs. Frequency

User can have two modes: LVD and MVD. The figures below explain the different behaviors for these modes. The inverter activates these modes depending on the country that is selected and the requirements for that country.

This feature is available for LVD and MVD grids. This feature allows the user to set a power reduction in a percent of the maximum power.

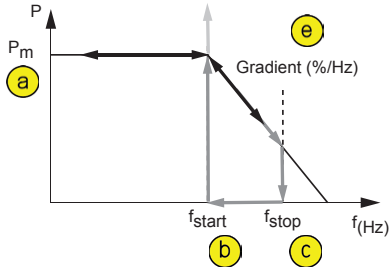


Figure 6.19.: LVD Curve power vs. frequency

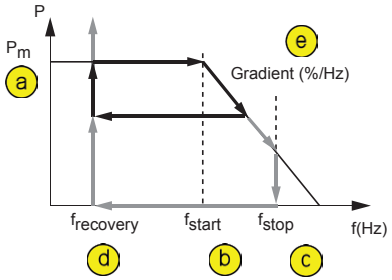


Figure 6.20.: MVD Curve power vs. frequency

Active Power Control	21. Jun 2010 13:50	
a Actual/Rated Power	[Actual]	
b Start Frequency	[50.20]	Hz
c Stop Frequency	[--]	Hz
d Recovery Frequency	[50.05]	Hz
e Gradient	[40]	%
Recovery Time	[--]	s
Mode	[ON]	

Figure 6.21.: Power vs. Frequency

NOTE

The Power vs Frequency function is required for LVD and MVD. Please make sure the Mode is ON and do not turn off.

Adjustable parameters

Parameter	Adjustable Values	Description
Actual / Rated Power		Actual or Rated can be selected
Start frequency	50.00 ... 55.00	The frequency when the power reduction starts
Stop frequency		Stop frequency means the frequency when power = 0. This value is calculated by the gradient and the start frequency.
Recovery frequency	50.00 ... 55.00	This feature is only for MVD. This value is equal to the frequency of the grid connection.
Gradient	0 ... 100 %	This feature adjusts the gradient. The units are % / Hz.
Recovery Time		Not applicable for LVD or MVD
Mode	ON | OFF	Switches the feature on and off

6.3.6.3.3 Constant cos φ

This feature is available for LVD and MVD grids. This feature allows the user to set up a constant cos φ.

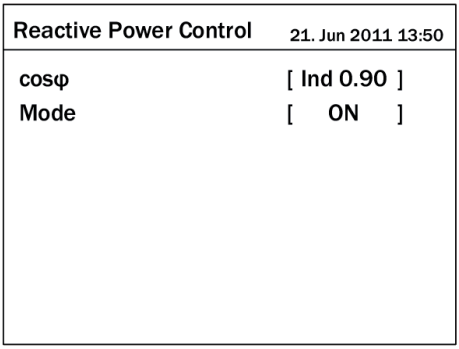


Figure 6.22.: Constant cos φ settings page

Adjustable parameters

Parameter	Adjustable values	Description
cos φ	inductive | capacitive	Sets the cos φ to the adjusted value.
	Ind 0.8 ... Ind 0.99, 1, Cap 0.8 ... Cap. 0.99	
Mode	ON | OFF	Switches the feature on and off

6.3.6.3.4 cosφ(P)

This feature is available for LVD and MVD grids.

With this feature a cos φ can be assigned to a power ratio P/Pn.

The following curve is an example how the values could be set:

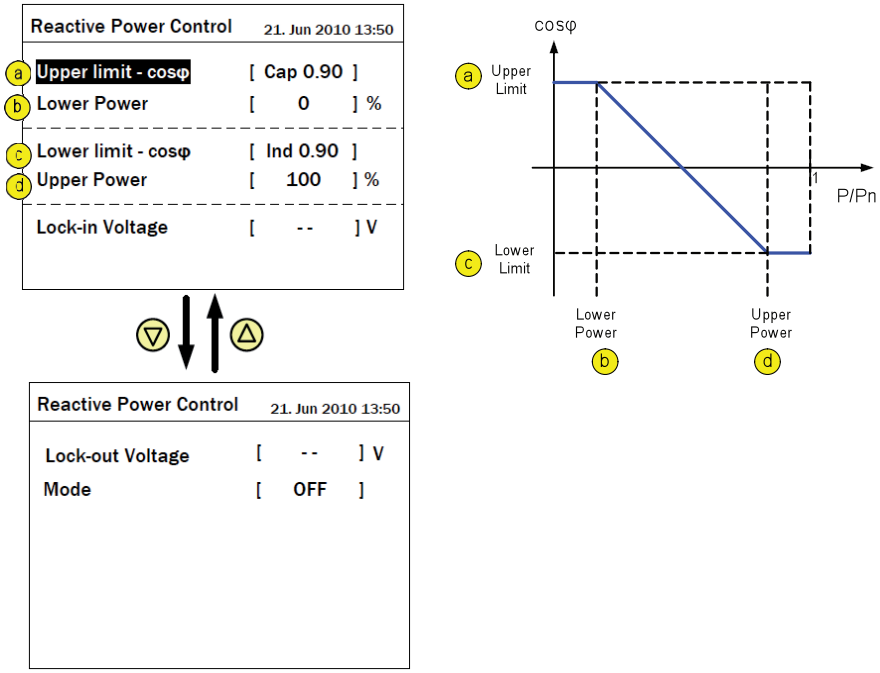


Figure 6.23.: cos φ(P) settings page

Adjustable parameters

Parameter	Adjustable values	Description
Upper limit - cos φ	Ind 0.80 ... Cap 0.80	The upper limit cos φ must be greater than the lower limit cos φ
Lower Power	0 ... 100 %	
Lower limit - cos φ	Ind 0.80 ... Cap 0.80	
Upper Power	0 ... 100 %	The upper power must be greater than the lower power
Lock-in Voltage		Not used for DE LVD/MVD
Lock-out Voltage		Not used for DE LVD/MVD
Mode	ON I OFF	This switches the feature on and off

6.3.6.3.5 Constant Reactive Power

This feature is available for MVD grids only.

This feature allows a constant cos reactive power to be set.

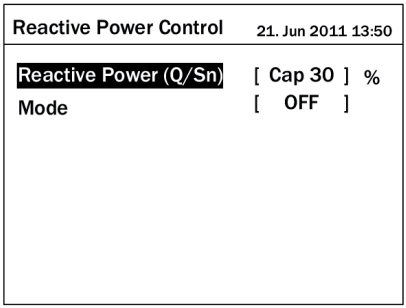


Figure 6.24.: Constant Reactive Power settings page

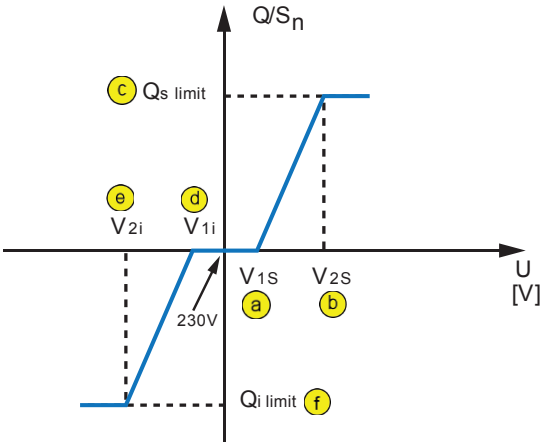
Adjustable parameters

Parameter	Adjustable values	Description
Reactive power Q/Sn	-60 ... +60% inductive | capacitive	Reactive power ratio in relation to apparent power.
Mode	ON I OFF	This switches the feature on and off

6.3.6.3.6 Q(V)

This feature is available for MVD grids only.

This feature allows the reactive power ratio Q/Sn to be assigned to a voltage V



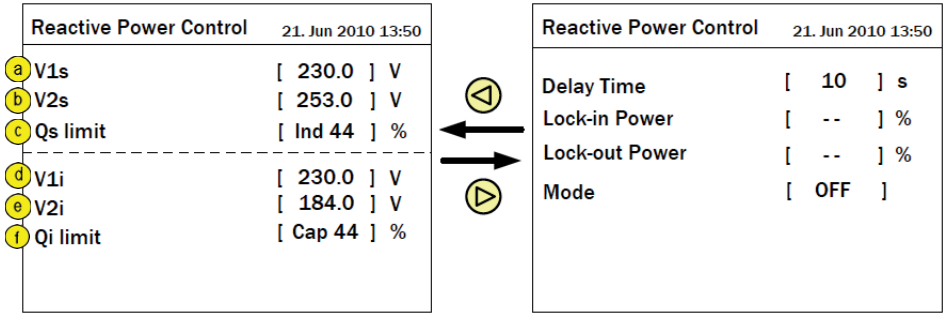


Figure 6.25.: Q(V) settings page

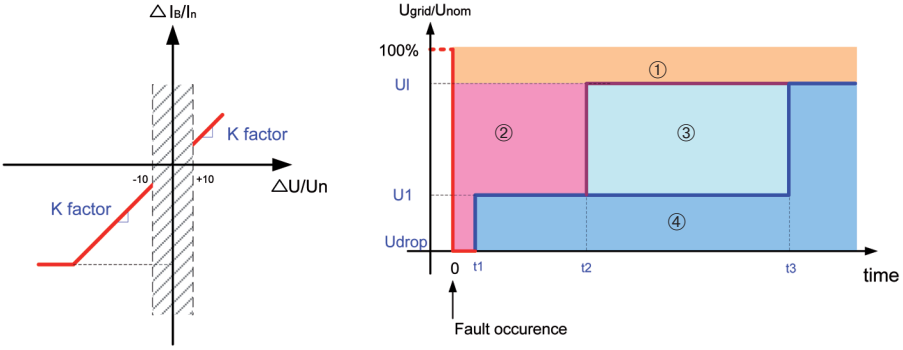
Adjustable parameters

Parameter	Menu Name	Adjustable values	Description
Lower Q/Sn	Qi Limit	0 ... 60% inductive | capacitive	Must be within the range Ind 60% ... Cap 60%
Upper Q/Sn	Qs Limit	0 ... 60% inductive | capacitive	Must be within the range Ind 60% ... Cap 60%
Lower capacitive point	V2i	184 ... 264 V	
Upper capacitive point	V1i	184 ... 264 V	For DE MVD the default V1i = V1s = 230 V
Lower inductive point	V1s	184 ... 264 V	
Upper inductive point	V2s	184 ... 264 V	
Delay time		0 ... 10 s	
Lock-in Power		not applicable	Not used for DE MVD
Lock-out Power		not applicable	Not used for DE MVD
Mode		ON I OFF	This switches the feature on and off

6.3.6.3.7 Fault Ride Through (FRT)

This feature is available for MVD grids only.

This feature allows the Fault Ride Through features to be set.



① No instability or disconnection from the network

② Feed-in reactive current depends on K factor

③ Same as area 2, Feed-in reactive current depends on K factor

④ Disconnects from the network

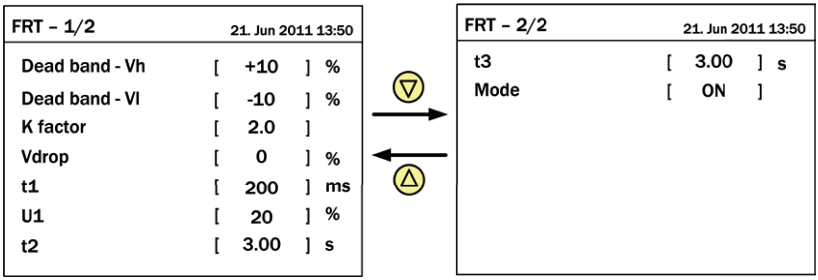


Figure 6.26.: Fault Ride Through settings page

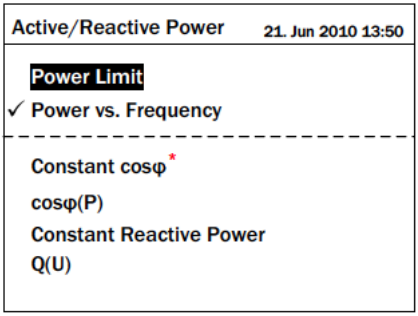
Adjustable parameters

Parameter	Adjustable values	Description
Dead band - Vhigh	+0 ... +20 %	
Dead band - Vlow	-20 ... 0 %	
K factor	0 ... 10	
Vdrop	0 ... 90%	
t1	0 ... 500 ms	
U1	20 ... 90%	
t2	0.01 ... 5 s	
t3	0.01 ... 5 s	
Mode	ON | OFF	This switches the feature on and off

6.3.6.4 Active/Reactive Power control for Italy CEI 0-21 and Italy A70

Below is an overview of the features that are adjustable to control the production of active and reactive power for Italy CEI 0-21 and Italy A70. Italy CEI 0-21 is applicable for low voltage grids and A70 is applicable for medium voltage grids.

Feature	Available for		Description
	CEI 0-21	A70	
Active power control			
Power limit	x	x	To reduce the maximum power production
Power vs. frequency	x	x	To set the power gradiant in dependency of the frequency
Reactive power control			
Constant cos φ			This feature is not available for CEI 0-21 and A70.
cos φ (p)	x	x	To set a cos φ (inductive or capacative) in dependency of the active power ratio P/P_n
Constant reactive power	x	x	To set the reactive power ratio Q/S_n.
Q (V)	x	x	To set the reactive power ratio Q/S_n in dependency of the voltage V.



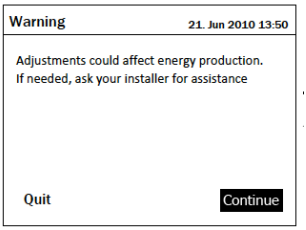
Note: User can activate both the Power Limit and the Power vs. Frequency at the same time.

For the reactive power control features: cosφ(P), Constant Reactive Power, and Q(V) only one of these items can be activated at a time.

✓ indicates a function is executing

* This feature is disabled for CEI 0-21 and A70 although it will appear in the menu

Figure 6.27.: Active/Reactive Power settings page



Note: Before adjusting the Active/Reactive Power settings, a Warning window will be displayed, that you should read and make a selection to continue or to quit. Please see caution messages related to adjusting the settings.

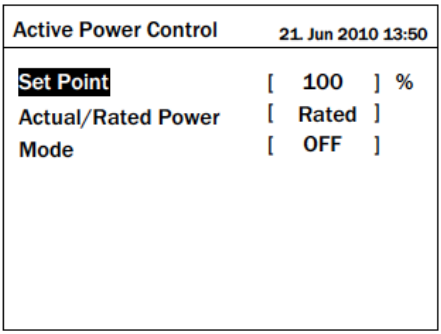
CAUTION

Machine and equipment damage may occur.

- ► Please only adjust active and reactive power settings if you are a qualified electrical technician with the knowledge to do so
- ► Adjustments may affect energy production
- ► Some values entered in the Active/Reactive Power settings must come from the local grid operator. Please check with them before making any adjustments

6.3.6.4.1 Power Limit

User can select set percentage of actual or rated power to limit inverter's output power. Inverter will start the action once the user sets the Mode to "ON". This feature is available for Italy CEI 0-21 and Italy A70.



Note: For explanation of Actual vs Rated Power please see figure 6.18.

Figure 6.28.: Power Limit settings page

Adjustable parameters

Parameter	Adjustable Values	Description
Set point	0 ... 100%	Sets the power reduction to the adjusted value. The value is multiplied with the value of the Locked power limitation.
Actual/Rated	Actual | Rated	Select Actual or Rated Power
Mode	ON | OFF	Switches the feature on and off.

6.3.6.4.2 Power vs. Frequency

This function is available for CEI 0-21 and A70. The figure below explain the behavior of this function. Note that the Italy CEI 0-21 and A70 curves are different than the Germany LVD and MVD curves.

This feature allows the user to set a power reduction in a percent of the maximum power.

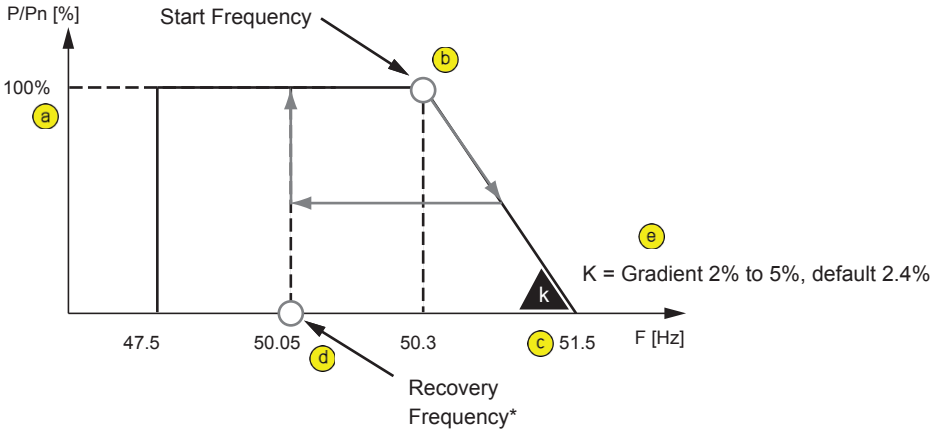
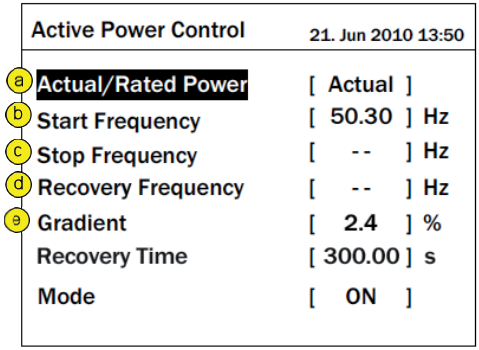


Figure 6.29.: Curve power vs. frequency



NOTE

The Power vs Frequency function is required for CEI 0-21 and A70. Please make sure the Mode is ON and do not turn off.

*Recovery Frequency is defined in the grid setting parameters 49.9 - 50.1 Hz by default.

Figure 6.30.: Power vs. Frequency

Adjustable parameters

Parameter	Adjustable Values	Description
Actual / Rated Power		Actual will be default
Start frequency	50 - 55 Hz	50.3 Hz will be the default. This is the frequency when the power reduction starts
Stop frequency		Stop frequency means the frequency when power = 0. This value is calculated by the gradient and the start frequency.

Recovery frequency	Nonadjustable	
Gradient	2.0 ... 5.0 %	2.4 % is the default
Recovery time	300 seconds	
Mode	ON | OFF	Switches the feature on and off

6.3.6.4.3 Constant cosφ

This feature is not available for CEI 0-21 or A70.

6.3.6.4.4 cosφ(P)

This feature is available for Italy CEI 0-21 and Italy A70.

With this feature a solar inverter can regulate the power factor as a function of the actual delivered active power.

The following graph is an example how the values could be set:

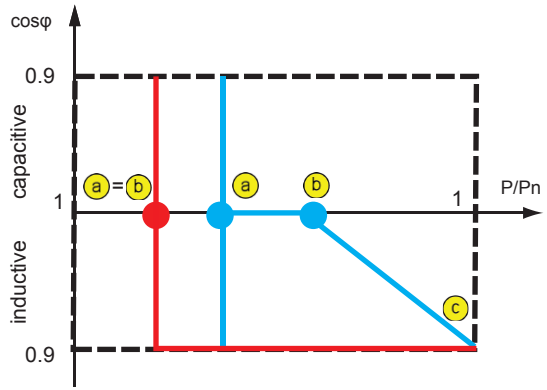


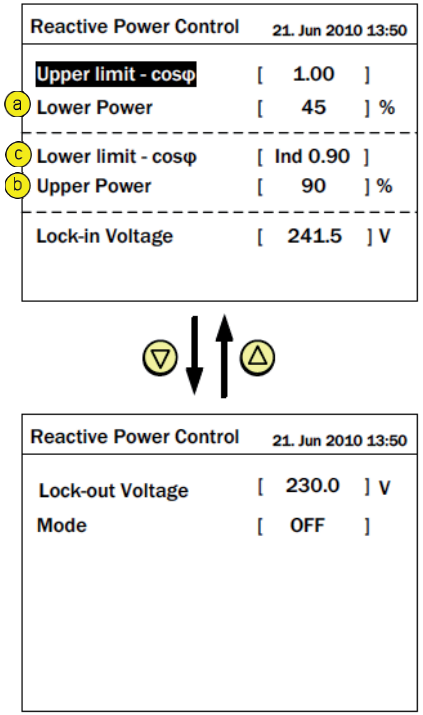
Figure 6.31.: cosφ(P) graph

There are two possible curves defined in the cos*φ(P) graph, curve A in blue (the default) and curve B in red.* Pn = nominal power

Curve A (in blue on Figure 6.30)
A is identified from Plock-out = value from local grid operator and cosφ = 1
B is identified from Plock-in = value from local grid operator and cosφ = 1
C is identified from P = Pn and cos = cosφmax

Curve B (in red on Figure 6.30)
A is identified from Plock-out = P = value from local grid operator and cosφ = 1
B is identified from Plock-in = value from local grid operator and cosφ = 1
C is identified from P = Pn and cos = cosφmax

Important:
When Plock-out = Plock-in then Curve B will be followed.
When Plock-out is ≠ Plock-in then Curve A will be followed.



Notes:

In the formulas on the previous page, the parameters mentioned are named differently as in the menu page

Curve A (in blue) Figure 6.30

Point A = Plockout = Lower Power

Point B = Plockin = Upper Power

Point C = Lower limit • cosφ

Curve A is followed when Lower Power is not equal to Upper Power

Curve B (in Red) Figure 6.30

Point A (Lower Power) = Point B (Upper Power)

Point C = Lower limit • cosφ

Curve B is followed when Lower Power = Upper Power

Figure 6.32.: cos φ(P) settings page

Adjustable parameters for cos φ(P)

Parameter	Adjustable values	Curve A	Curve B
Upper limit - cos φ	Ind 0.80 ... Cap 0.80	Cap 1.0	Cap 1.0
Lower Power	0 ... 100 %	45% is shown but adjust to grid operator requested value	should equal Upper Power
Lower limit - cos φ	Ind 0.80 ... Cap 0.80	Ind 0.90	Ind 0.90
Upper Power	0 ... 100 %	90% is shown but adjust to grid operator requested value	should equal Lower Power

Parameter	Adjustable values	Curve A	Curve B
Lock-in Voltage*	230-253 V	241.5 V is default value and is 1.05Vn (Vn = 230V)	
Lock-out Voltage*	207-230 V	230 V is default value (adjustable at 0.98 Vn to Vn; Vn=230V). When the grid voltage ≤ the Lock-out voltage	
Mode	ON I OFF	This switches the feature on and off. Default mode is OFF.	

*These values are only adjustable if Country setting is Italy CEI-021 or Italy A70. This means the inverter will feed in reactive power depending on the active power once the grid voltage is higher than Lock-in Voltage. When grid voltage is lower than Lock-out voltage then inverter would go back to pure active power control.

For countries other than Italy, cos φ(P) control would not be effected by the grid voltage.

6.3.6.4.5 Constant Reactive Power

This feature is available for Italy CEI 0-21 and Italy A70.

This feature allows a constant cos reactive power to be set.

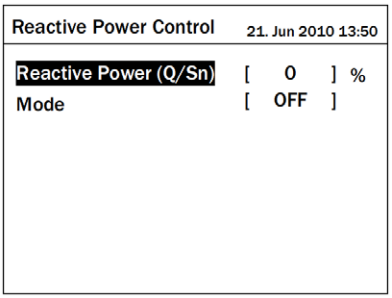


Figure 6.33.: Constant Reactive Power settings page

Adjustable parameters

Parameter	Adjustable values	Description
Reactive power Q/Sn	-60 ... +60% inductive | capacitive	Reactive power ratio in relation to apparent power. Enter the value requested by the grid operator
Mode	ON I OFF	This switches the feature on and off

6.3.6.4.6 Q(V)

This feature is available for Italy CEI 0-21 and Italy A70.

This feature allows the reactive power ratio Q/Sn to be assigned to a voltage V.

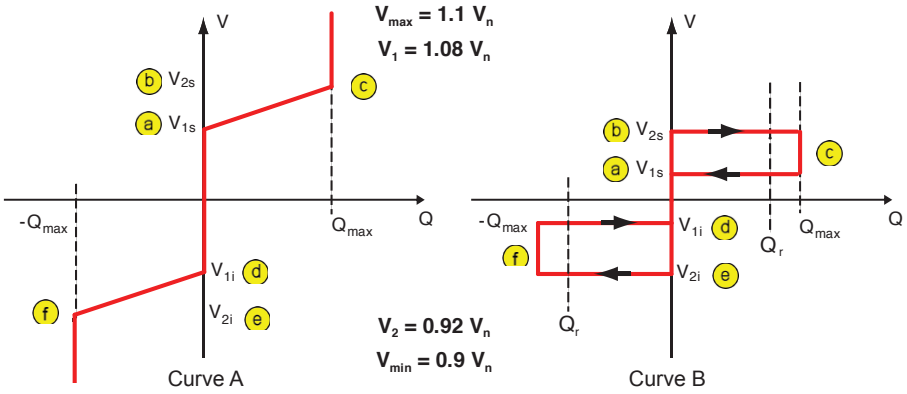
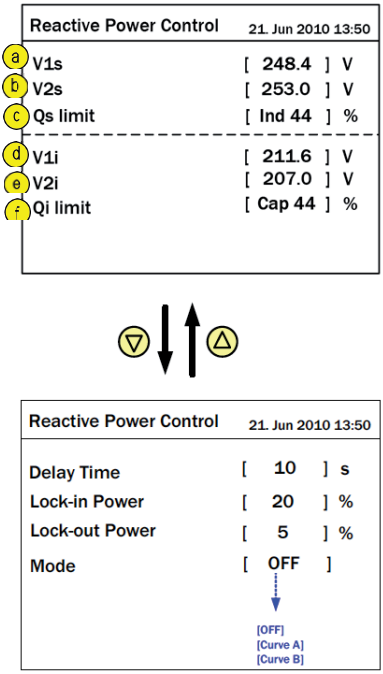


Figure 6.34.: Q(V)



Note: Qs limit and Qi limit are calculated based on Q/Sn.

Figure 6.35.: Q(V) Settings Page

Adjustable parameters

Parameter	Adjustable values	Description
Qs limit (Q/Sn)	0 ... 60% inductive | capacitive	Ind 44%
Qi limit (Q/Sn)	0 ... 60% inductive | capacitive	Cap 44%
V1s	230 ... 264.5 V	248.4 V
V2s	230 ... 264.5 V	253 V
V1i	184 ... 230 V	211.6 V
V2i	184 ... 230 V	207 V
Plock-in*	10 ... 100%	20% is shown but use value from the grid operator
Plock-out*	5 ... 10%	5% is shown but use value from the grid operator
Delay time	0 ... 120 s	10 s
Mode	Curve A I Curve B I OFF	This switches between Curve A and Curve B or OFF

*This item is only adjustable and enabled if Country settings is Italy CEI 0-21 or Italy A70.

6.3.6.4.7 LVFRT Low Voltage Fault Ride Through (LVFRT)

This feature is available for CEI 0-21 and A70.

This feature allows the Fault Ride Through features to be set.

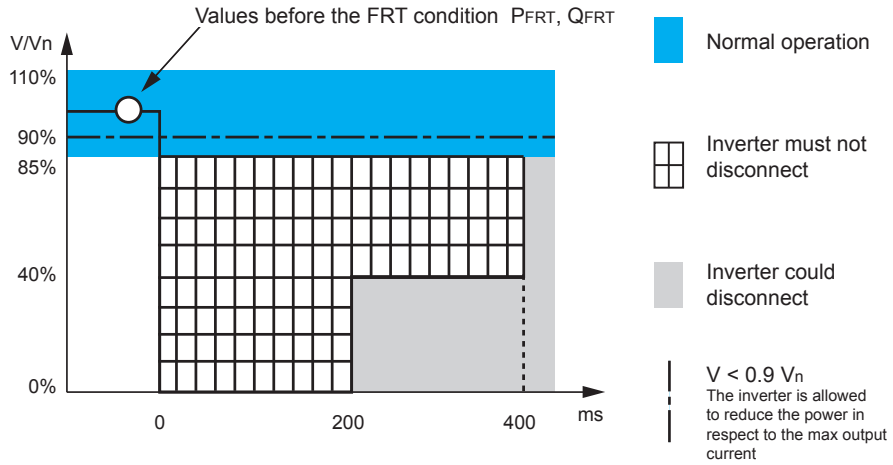


Figure 6.36.: Low Voltage Fault Ride Through graph

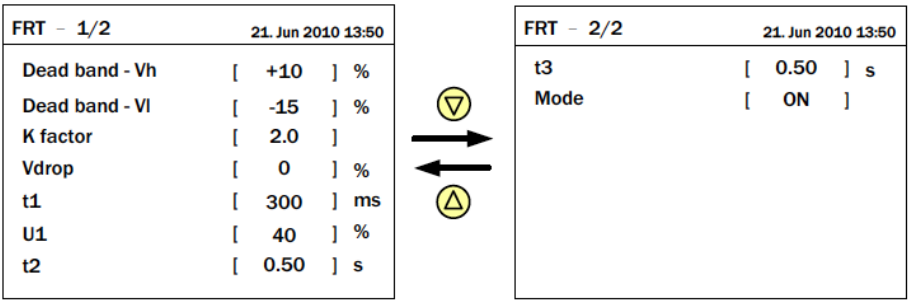


Figure 6.37.: Fault Ride Through settings page

Adjustable parameters

Parameter	Adjustable values	Description
Dead band - Vhigh	+0 ... +20 %	10%
Dead band - Vlow	-20 ... 0 %	-15%
K factor	Do not adjust	
Vdrop	Do not adjust	
t1	Do not adjust	
U1	Do not adjust	
t2	Do not adjust	
t3	Do not adjust	
Mode	ON | OFF	This switches the feature ON and OFF

7. Maintenance

In order to ensure the normal operation of the PV Inverter, please check it regularly at least once every 6 months. Check that all the terminals, screws, cables are securely in place. If there are any damaged parts, please contact a qualified technician to repair it or to replace it with a new spare part. To ensure that no foreign contaminants enter the warm air outlets, please have them cleaned every 6 months by qualified technicians.

WARNING

Death and serious injury may occur!

► Before engaging in maintenance of the inverter, please disconnect AC and DC power to avoid risk of electric shock.!

7.1 Cleaning the Fans

Loosen the 4 screws in the four corners of the fan bracket first (circled below). Pulling the bracket slightly away from the inverter, the user will notice 4 sets of fan connectors. Disconnect the fan connectors one by one and then pull the fan bracket from the inverter for cleaning. Call the support hotline for assistance in procuring a new replacement fan.

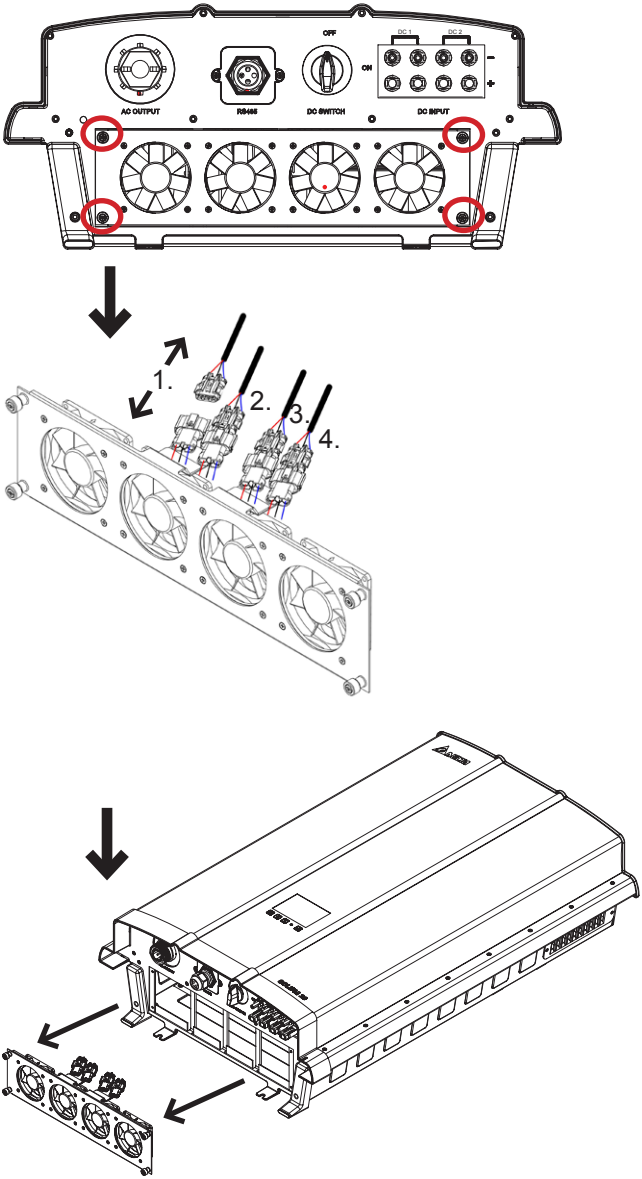


Figure 7.1.: Steps of removing the fan bracket from the inverter

7.2 Replace a Fan

If one of the fans has failed and needs to be replaced, user should remove the 4 screws (circled below) that attach the fan to the fan bracket. Next, pull the fan slightly away from the bracket and disconnect the fan connector located behind the fan bracket. The fan can now be removed and replaced with a new fan. Follow the procedure in reverse to install the new fan. (Figure 7-2 illustrates the replacement of the first fan on the fan bracket. Call the support hotline for assistance in procuring a replacement fan.

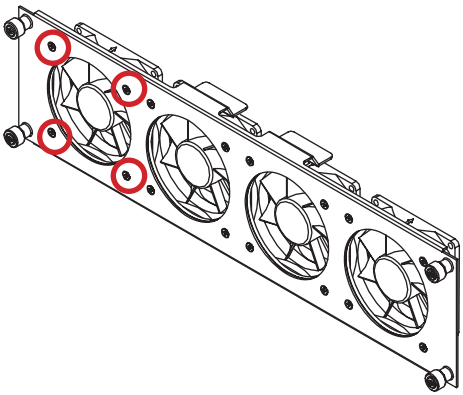


Figure 7.2.: Removing the fan from the fan bracket

7.3 Cleaning the Air Outlets

Figure 7.3 below shows the removal of the vent covers for cleaning. First remove the 4 screws that hold the vent cover to the inverter enclosure. Next, remove the vent cover from the inverter. With the vent cover removed, clean it on both sides. After cleaning one of the vents, proceed to take off the vent on the opposite side and clean in the same manner. Reinstall the vent covers securely after they have been cleaned. The cleaning of the air outlets as described above should be done on a regular basis for optimum inverter performance.

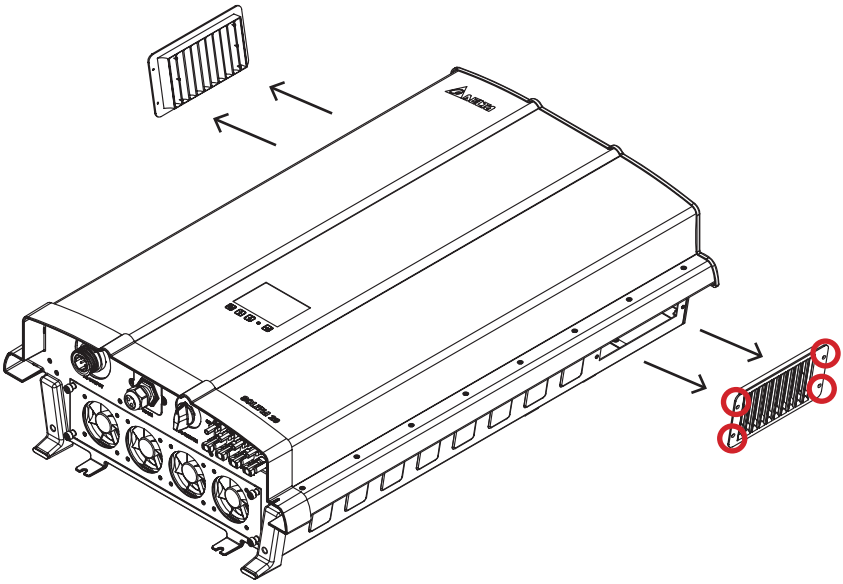


Figure 7.3.: Removing the Vent Covers for Cleaning

8. Measurements and Messages

8.1 Measurements

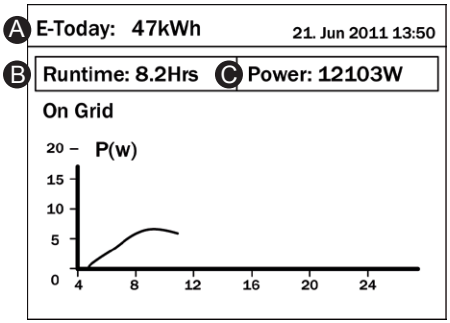


Figure 8.1.: Measurements on the Home Page

	Measurement	Description
A	E-Today	Total energy generated today
B	Runtime	Total PV inverter operation time for the day
C	Power	Actual power being generated

Table 8.1.: Home Page Measurements and Description

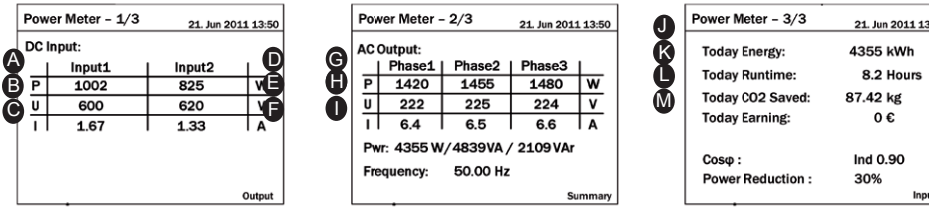


Figure 8.2.: Measurements on the Power Meter Pages

	Measurement	Description
A	Input 1 P	Power of DC Input 1
B	Input 1 V	Voltage of DC input 1
C	Input 1 I	Current of DC input 1
D	Input 2 P	Power of DC input 2
E	Input 2 V	Voltage of DC input 2
F	Input 2 I	Current of DC input 2
G	Output P	Power of AC Output
H	Output V	Voltage of AC Output
I	Output I	Current of AC Output
J	Today Energy	Total accumulated electricity generated for the day
K	Today Runtime	Total accumulated operation time for the day
L	Total CO2 saved	Total accumulated CO2 emissions retrenched to present time
M	Today Earning	Total accumulated Euro amount earned for the day

Table 8.2.: Power Meter Pages Measurements and Description

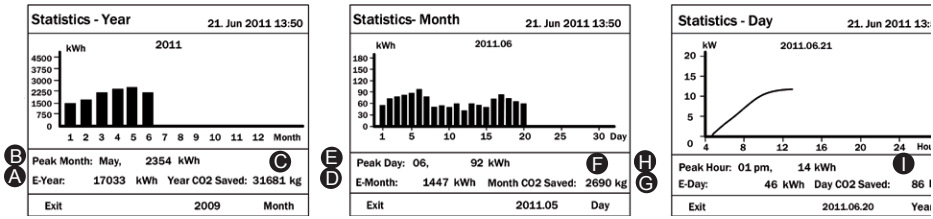


Figure 8.3.: Measurements on the Statistics Pages

	Measurement	Description
A	E-Year	Total accumulated electricity generated in a year
B	Peak Month	The peak month of electricity generated in the past year
C	Year CO2 saved	Total accumulated CO2 emissions retrenched in a year
D	E-Month	Total accumulated electricity generated in a month
E	Peak Day	The peak day of electricity generated in the past month
F	Month CO2 saved	Total accumulated CO2 emission retrenched in a month
G	E-Day	Total accumulated electricity generated in a day
H	Peak Hours	The peak hour of electricity generated in the past day
I	Day CO2 saved	Total accumulated CO2 emission retrenched for a day

Table 8.3.: Statistics Pages Measurements and Description

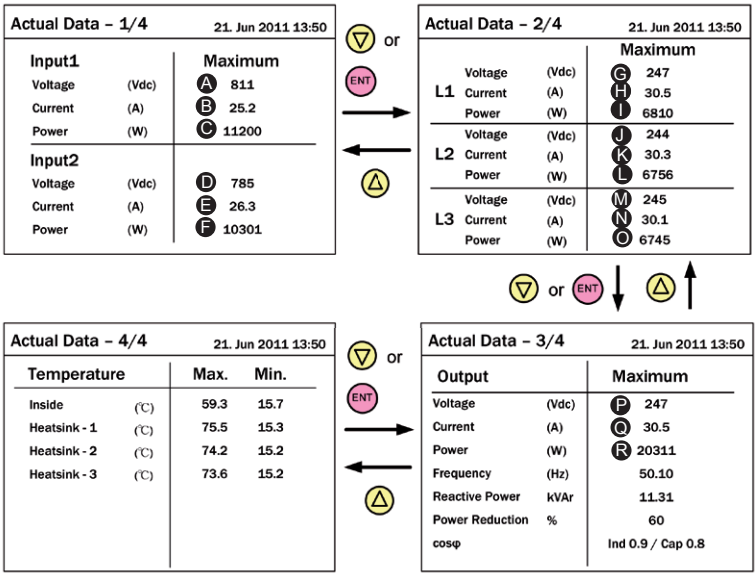


Figure 8.4.: Measurements on the Actual Data Pages

	Measurement	Description
A	Input 1 Volt. maximum	The maximum DC input 1 voltage
B	Input 1 I maximum	The maximum DC input 1 current
C	Input 1 P maximum	The maximum DC input 1 power
D	Input 2 Volt. maximum	The maximum DC input 2 voltage
E	Input 2 I maximum	The maximum DC input 2 current
F	Input 2 P maximum	The maximum DC input 2 power
G	L1 Volt. maximum	The maximum AC L1 phase voltage
H	L1 I maximum	The maximum AC L1 phase current
I	L1 P maximum	The maximum AC L1 phase power
J	L2 Volt maximum	The maximum AC L2 phase voltage
K	L2 I maximum	The maximum AC L2 phase current
L	L2 P maximum	The maximum AC L2 phase power
M	L3 Volt. maximum	The maximum AC L3 phase voltage
N	L3 I maximum	The maximum AC L3 phase current
O	L3 P maximum	The maximum AC L3 phase power
P	Output Volt. maximum	The maximum AC 3 phase voltage
Q	Output I maximum	The maximum AC 3 phase current
R	Output P maximum	The maximum AC 3 phase power

Table 8.4.: Actual Data Pages Measurement and Description

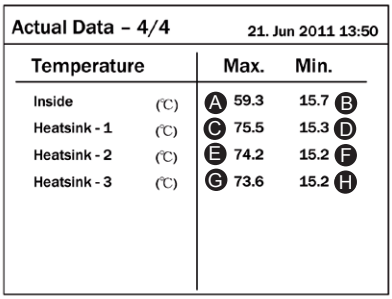


Figure 8.5.: Measurements of Temperature on the Actual Data Pages

	Temperature	
A	Inside max.	The maximum inverter inner temperature value
B	Inside min.	The minimum inverter inner temperature value
C	Heatsink-1 max.	The maximum Heatsink-1 temperature value
D	Heatsink-1 min.	The minimum Heatsink-1 temperature value
E	Heatsink-2 max.	The maximum Heatsink-2 temperature value
F	Heatsink-2 min.	The minimum Heatsink-2 temperature value
G	Heatsink-3 max.	The maximum Heatsink-3 temperature value
H	Heatsink-3 min.	The minimum Heatsink-3 temperature value

Table 8.5.: Temperature Measurement and Description

8.2 Messages

Message	Red LED on	Red LED blinks	Description
Errors			
AC Freq High	X		Grid frequency is over rating
AC Freq Low	X		Grid frequency is under rating
Grid Quality	X		Poor grid quality
HW Connect Fail	X		Can't detect grid sequence
No Grid	X		Grid voltage < 100V
AC Volt Low	X		Phase-L1, L2, or L3 voltage is under rating
AC Volt High	X		Phase-L1, L2, or L3 voltage is over rating
Solar1 High	X		DC1 voltage > 1000V
Solar2 High	X		DC2 voltage > 1000V
Faults			
HW DC Injection	X		DC injection is over rating
Temperature	X		Ambient, heatsink, or choke temperature is higher or lower than the normal operation range
HW NTC1 Fail	X		Temperature sensor 1 has failed
HW NTC2 Fail	X		Temperature sensor 2 has failed
HW NTC3 Fail	X		Temperature sensor 3 has failed
HW NTC4 Fail	X		Temperature sensor 4 has failed
Firmware Fail	X		Firmware is incompatible
HW DSP ADC1	X		DSP A/D failure – Vgrid or Iout
HW DSP ADC2	X		DSP A/D failure – Vin or Vbus
HW DSP ADC3	X		DSP A/D failure – Iin or Iboost
HW Red ADC1	X		Red. A/D failure – Vgrid or Vinv
HW Red ADC2	X		Red. A/D failure – Iout_dc
HW Efficiency	X		Efficiency is abnormal
HW COMM2	X		Can't communicate with Red. CPU
HW COMM1	X		Can't communicate with DSP
Ground Current	X		Residual current is over rating
Insulation	X		Array insulation has failed
HW Connected Fail	X		AC internal wire is disconnected
RCMU Fail	X		HW RCMU failure
Relay Test Short	X		One or more relays are defective - short

Message	Red LED on	Red LED blinks	Description
Relay Test Open	X		One or more relays are defective - open
Bus Unbalance	X		Bus voltage is unbalanced
HW Bus OVR	X		BUS or BUS+ or BUS- voltage is over rating
HW Bus UVR	X		BUS+ or BUS- voltage is under rating
AC Current High	X		Phase-L1, L2, or L3 current is over rating
HW CT A Fail	X		Current sensor-L1 failure
HW CT B Fail	X		Current sensor-L2 failure
HW CT C Fail	X		Current sensor-L3 failure
HW AC OCR	X		Output current is over hardware limit
Inverter Failure	X		Inverter Failure
HW ZC Fail	X		HW zero-crossing circuit failure
DC Current High	X		DC1 or DC2 current is over rating
Warnings			
HW FAN		X	Fan is locked or failed during operation
Solar1 Low		X	DC1 voltage is under rating
Solar2 Low		X	DC2 voltage is under rating

9. Troubleshooting

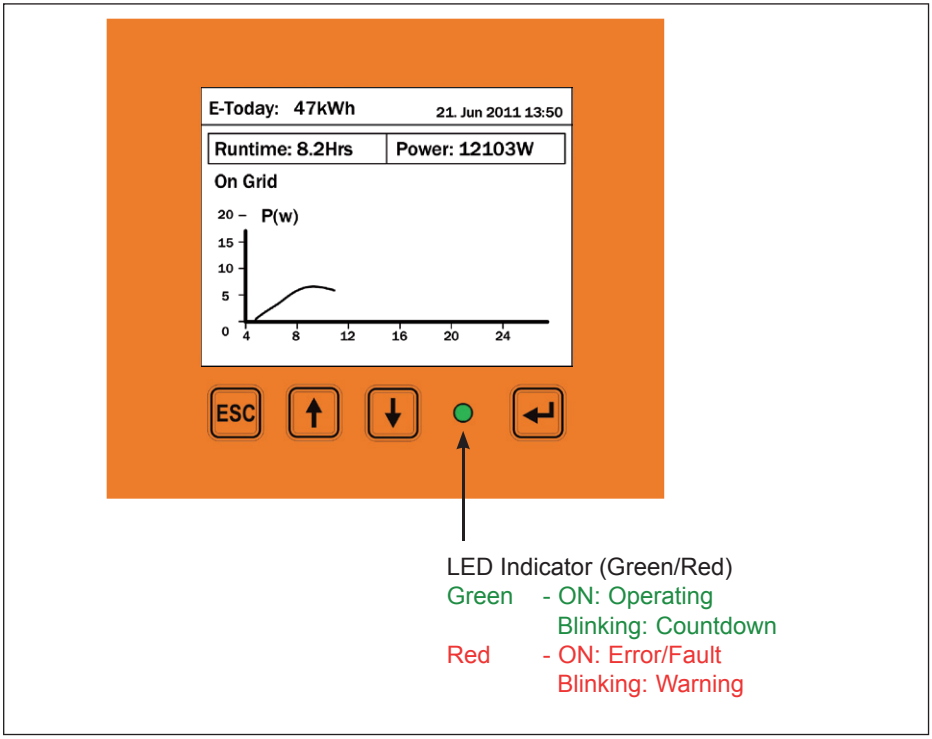


Figure 9.6.: LED Indicator

Message	Red LED on	Red LED blinks	Solution
Errors			
AC Freq High	X		► Check grid frequency on the inverter terminal ► Check the country setting
AC Freq Low	X		► Check grid frequency on the inverter terminal ► Check the country setting
Grid Quality	X		► Check the harmonics of the grid voltage ► Grid connection of the inverter may need to be further away from a non-linear load.

Message	Red LED on	Red LED blinks	Solution
HW Connect Fail	X		► Check the AC connection, must be according to the manual instructions ► Please contact your installation technician or DELTA technical support
No Grid	X		► Check the connection of the AC plug, ensure it is connected to the inverter and the AC breaker is on
AC Volt Low	X		► Check the utility voltage connection to the inverter terminal ► Check the country setting
AC Volt High	X		► Check the utility voltage connection to the inverter terminal ► Check the country setting
Solar1 High	X		► Modify the solar array setting and make the Voc less than 1000 Vdc
Solar2 High	X		► Modify the solar array setting and make the Voc less than 1000 Vdc
Faults			
HW DC Injection	X		► Check the utility waveform. Grid connection of the inverter may need to be further from the non-linear load. ► Please contact your installation technician or DELTA technical support
Temperature	X		► Check the installation ambient and environment
HW NTC1 Fail	X		► Please contact your installation technician or DELTA technical support
HW NTC2 Fail	X		► Please contact your installation technician or DELTA technical support
HW NTC3 Fail	X		► Please contact your installation technician or DELTA technical support
HW NTC4 Fail	X		► Please contact your installation technician or DELTA technical support
Firmware Fail	X		► Please contact your installation technician or DELTA technical support
HW DSP ADC1	X		► Please contact your installation technician or DELTA technical support
HW DSP ADC2	X		► Please contact your installation technician or DELTA technical support
HW DSP ADC3	X		► Please contact your installation technician or DELTA tech. support
HW Red ADC1	X		► Please contact your installation technician or DELTA tech. support

Message	Red LED on	Red LED blinks	Solution
HW Red ADC2	X		► Please contact your installation technician or DELTA tech. support
HW Efficiency	X		► Please contact your installation technician or DELTA technical support
HW COMM2	X		► Please contact your installation technician or DELTA technical support
HW COMM1	X		► Please contact your installation technician or DELTA technical support
Ground Current	X		► Check the insulation of Solar inputs ► Check the capacitance (+<-> GND & - <-> GND), must be < 2.5 µF. Install an external transformer if necessary ► Please contact your installation technician or DELTA technical support
Insulation	X		► Check the insulation of solar inputs ► Check the capacitance, dry the PV panel if necessary ► Please contact your installation technician or DELTA technical support
HW Connected Fail	X		► Please contact your installation technician or DELTA technical support
RCMU Fail	X		► Please contact your installation technician or DELTA technical support
Relay Test Short	X		► Please contact your installation technician or DELTA technical support
Relay Test Open	X		► Please contact your installation technician or DELTA technical support
Bus Unbalance	X		► Check the inputs connections ► Check the PV Array insulation ► Please contact your installation technician or DELTA technical support
HW Bus OVR	X		► Check the inputs connections ► Check the PV Array insulation ► Please contact your installation technician or DELTA technical support ► Modify the solar array setting and make the Voc less than 1000 Vdc
AC Current High	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW CT A Fail	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation

Message	Red LED on	Red LED blinks	Solution
HW CT B Fail	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW CT C Fail	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW AC OCR	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
Inverter Failure	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW ZC Fail	X		► Please contact your installation technician or DELTA technical support
DC Current High	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
Warnings			
HW FAN		X	► Remove the object that is stuck in the fan(s) ► Replace the defective fan(s) ► Check the connections of all fans
Solar 1 Low		X	► Check the DC1 voltage connection to the inverter terminal ► Check all switching devices in boost1
Solar 2 Low		X	► Check the DC2 voltage connection to the inverter terminal ► Check all switching devices in boost2

Table 9.1.: Troubleshooting Message/Solution Description

10. Decommissioning

Decommissioning Procedure

If it is necessary to put the SOLIVIA 15 TL / 20 TL out of operation for return or maintenance, please follow the instructions below:

WARNING

Death and serious injury may occur.

To avoid injuries, please follow the below procedures:

1. Switch off AC circuit breaker to disconnect with electrical grid.
2. Switch off the DC Disconnect switch to disconnect with DC power input.
3. Use the proper voltage meter to confirm that the AC and DC power connections are void of any current.
4. Remove the AC wiring immediately to completely disconnect with electrical grid.
5. Remove the DC wiring to disconnect with PV array.
6. Remove the Communication module RS485 with the computer connection.
7. After finishing all the procedures, you can remove the SOLIVIA 15 TL / 20 TL from the mounting bracket.

11. Technical data

11.1 Specification

NOTE

The specification is subject to change. Please check the web site at www.solar-inverter.com for the latest version.

	15EUG4TL	20EUG4TL
INPUT (DC)		
Max. recommended PV power	19 kW_P	25 kW_P
Recommended PV power range	14 ... 19 kW_P	18 ... 25 kW_P
Nominal power	15.3 kW	20.4 kW
Operating voltage	250 ... 1000 V_{DC}	
MPP voltage range @ nominal power	350 ... 800 V_{DC}	
Nominal voltage	630 V_{DC}	
Start up power	40 W	
Absolute maximum voltage	1000 V	
Number of inputs	4 inputs (2 MPP trackers)	
Max. current	48 A (24 A x 2)	60 A (30 A x 2)
OUTPUT (AC)		
Max. apparent power [1)]	15.75 kVA	21.0 kVA
Nominal apparent power	15.0 kVA	20.0 kVA
Voltage range (3 phase) [2)]	230 / 400 V_{AC} (3-Phase + N + PE)*	
Nominal current	22 A	29 A
Max. current	25 A	32 A
Nominal frequency	50/60 Hz	
Frequency range [2)]	50 Hz: 45 ... 55 Hz, 60 Hz: 55 ... 65 Hz	
Power factor	Cap 0.80 - Ind 0.80	
Total harmonic distortion	< 3 % @ nominal apparent power	
DC current injection	< 0.5 % rated current	
Night-time loss	< 2 W	
GENERAL SPECIFICATION		
Maximum efficiency	98.0 % for 15 TL and 20 TL	
EU efficiency	97.8 % for 15 TL and 20 TL	
Operating temperature	-20 - +60° C (Derating at 40 - 60° C)	
Storage temperature	-20 - +70° C	
Humidity	0 - 90 %	

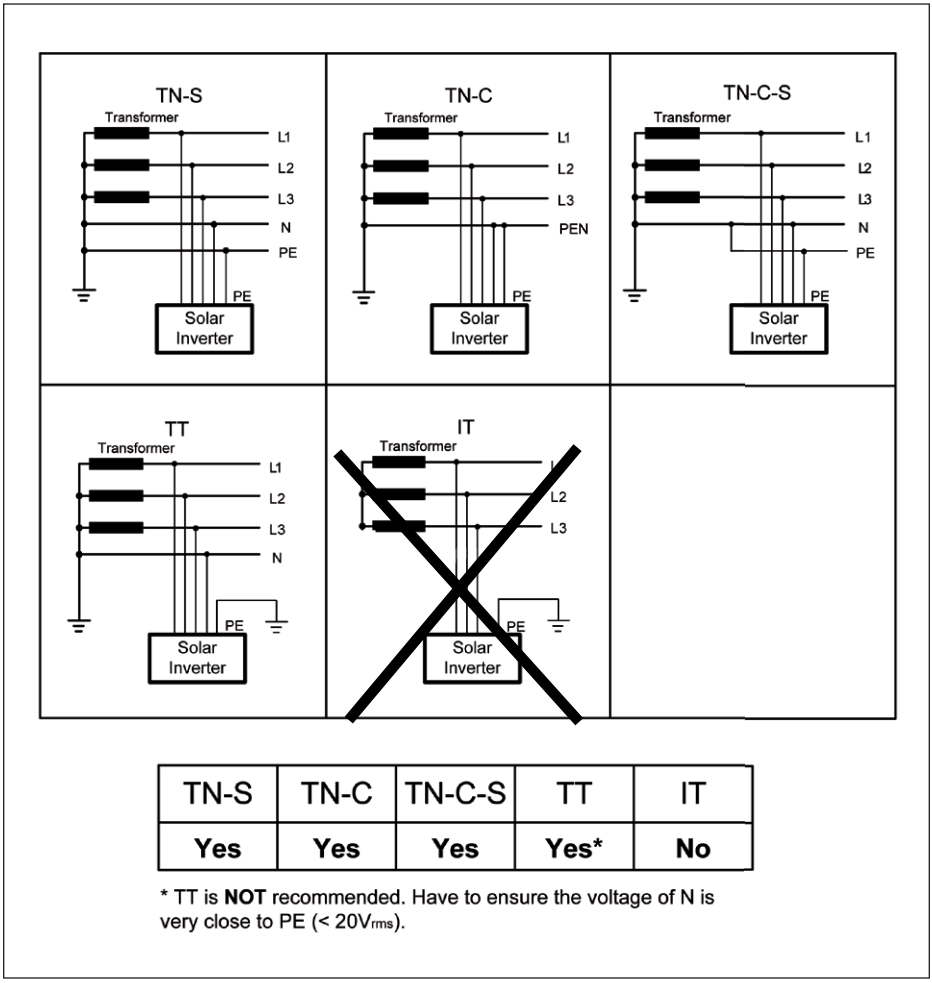
	15EUG4TL	20EUG4TL
Max. Operating Altitude	2000 m	
MECHANICAL DESIGN		
Size (L x W x D)	952 x 625 x 275 mm	
Weight	67.2 kg	67.2 kg
Enclosure	Powder coated aluminum	
Cooling	Fan	
AC connector	Amphenol C16-3	
DC connector pairs	4 Multicontact MC4	
Communication interfaces	2 RJ45 / RS485	
DC disconnector	Integrated	
Display	Black / white graphical LCD	
STANDARDS / DIRECTIVES		
Protection degree [3]	IP55 lower section / IP65 upper section (see figure 4-1 for further detail)	
Safety class	1	
Configurable trip parameters	Yes	
Insulation monitoring	Yes	
Overload behavior	Current limitation, power limitation	
Safety	IEC62109-1 / -2, AS/NZS 3100	
Grid Interface	VDE-AR-N 4105, BDEW, VDE 0126-1-1; G59/2; EN 50438; UTE C15-712-1, Synergrid C10/C11 (fulfills C10/C11 transitional rule from June 2012), RD661, RD1699, CEI 0-21, TERNA A70, AS 4777	
EMC	EN61000-6-2; EN61000-6-3; EN61000-3-11; EN61000-3-12, C-Tick	

[1] The maximum AC apparent power indicates the power an inverter is able to deliver. This maximum apparent power may not necessarily be reached.
[2] AC voltage and frequency range will be programmed according to the individual country requirements.
[3] IP55 for cooling section / IP65 for electronics

11.2 Cable Recommendations

Power wiring		
Current rating	Cross-section	Recommended max. cable loss calculation
AC 30 A	Calculated based on needed length, used material, cable losses and etc.	<1 %
DC 30 A	6 mm^2	<1 %
Communication cable		
RS485 modular communication cable / cross wired 8 poles		

11.3 Earthing Systems



TN-S	TN-C	TN-C-S	TT	IT
Yes	**Yes**	**Yes**	**Yes***	**No**

* TT is **NOT** recommended. Have to ensure the voltage of N is very close to PE (< 20V_{rms}).

Figure 11.1.: Earthing Systems

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Products Services
Germany GmbH
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86842 Türkheim
Deutschland
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Unbedenklichkeitsbescheinigung

Antragsteller: Delta Energy Systems Germany GmbH
Tscheulinstraße 21
79331 Teningen
Germany

Erzeugnis: Selbsttätige Schaltstelle zwischen einer netzparallelen Eigenerzeugungsanlage und dem öffentlichen Niederspannungsnetz

Modell: SOLIVIA15EUG4TL; SOLIVIA20EUG4TL

Bestimmungsgemäße Verwendung:

Selbsttätige Schaltstelle mit dreiphasiger Netzüberwachung gemäß DIN V VDE V 0126-1-1:2006-02 für Photovoltaikanlagen mit einer dreiphasigen Paralleleinspeisung über Wechselrichter in das Netz der öffentlichen Versorgung. Die selbsttätige Schaltstelle ist integraler Bestandteil der oben angeführten trafolosen Wechselrichter. Diese dient als Ersatz für eine jederzeit dem Verteilungsnetzbetreiber (VNB) zugängliche Schaltstelle mit Trennfunktion.

Prüfgrundlagen:

DIN V VDE V 0126-1-1 (VDE V 0126-1-1):2006-02 und „Eigenerzeugungsanlagen am Niederspannungsnetz, 4. Ausgabe 2001, Richtlinie für Anschluss und Parallelbetrieb von Eigenerzeugungsanlagen am Niederspannungsnetz" mit VDN Ergänzungen, Stand 2005 vom Verband der Elektrizitätswirtschaft (VDEW) und vom Verband der Netzbetreiber (VDN).

Ein repräsentatives Testmuster der oben genannten Erzeugnisse entspricht den zum Zeitpunkt der Ausstellung dieser Bescheinigung geltenden sicherheitstechnischen Anforderungen der aufgeführten Prüfgrundlagen für die bestimmungsgemäße Verwendung.

Bericht Nummer: 11TH0291-VDE0126
Zertifikat Nummer: U11-693
Datum: 2011-08-17 **Gültig bis:** 2014-07-27

Achim Hänchen

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Certificate of compliance

Applicant: Delta Energy Systems Germany GmbH
Tscheulinstraße 21
79331 Teningen
Germany

Product: Automatic disconnection device between a generator and the public low-voltage grid

Model: SOLIVIA15EUG4TL; SOLIVIA20EUG4TL

Use in accordance with regulations:

Automatic disconnection device with three-phase mains surveillance in accordance with Engineering Recommendation G59/2 for photovoltaic systems with a three-phase parallel coupling via an inverter in the public mains supply. The automatic disconnection device is an integral part of the aforementioned inverter. This serves as a replacement for the disconnection device with isolating function that can access the distribution network provider at any time.

Applied rules and standards :

DIN V VDE V 0126-1-1:2006-02 (Redundancy) and Engineering Recommendation G59/2:The default values for "Small Power Stations" on the low-voltage grd were verified.

The safety concept of an aforementioned representative product corresponds at the time of issue of this certificate of valid safety specifications for the specfied use in accordance with regulations.

Report number: 11TH0291-G59/2_DelTe
Certificate nummer: U11-925
Date of issue: 2011-10-12 **Valid until:** 2014-10-11

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Certificat de conformité

Demandeur: **Delta Energy Systems Germany GmbH**
Tscheulinstraße 21
79331 Teningen
Allemagne

Produit: **Dispositif de déconnexion automatique entre un générateur et le réseau public à basse tension**

Modèle: **SOLIVIA15EUG4TL; SOLIVIA20EUG4TL**

À utiliser conformément aux réglementations:

Dispositif de coupure automatique avec une surveillance du réseau triphasé, conformément à C10/11 – 06.2006, appendice 3, pour des systèmes photovoltaïques avec un couplage parallèle triphasé, via un convertisseur dans l'alimentation électrique publique. Le dispositif de coupure automatique fait partie intégrante de ce convertisseur. Il remplace le appareil de déconnexion avec une fonction isolante, auquel le fournisseur du réseau de distribution peut accéder à tout moment.

Réglementations et normes appliquées:

C10/11 – 06.2006
DIN V VDE V 0126-1-1:2006-02

Un echantillon représentatif des produits mentionnés ci-dessus correspond à la date de la delivrance de ce certificat en vigueur des exigences de sécurité technique et pour l´utilisation conformément à sa destination.

Numéro de rapport: **11TH0291-C10-11_DelTe**
Numéro de certificat: **U11-907**
Délivré le: **2011-10-04** **Valide jusque le:** **2014-10-03**

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Certificat de conformitate

Solicitant: **Delta Energy Systems (Deutschland) GmbH**
Tscheulinstr. 21
79331 Teningen
Germania

Produs: **Dispozitiv de deconectare automată între generator şi reţelele de distribuţie publică de joasă tensiune**

Model: **SOLIVIA15EUG4TL; SOLIVIA20EUG4TL**

A se utiliza în conformitate cu reglementările de mai jos:

Dispozitiv de deconectare automată a sistemului de supraveghere a curentului trifazic în conformitate cu DIN V VDE V 0126-1-1:2006-02 pentru sistemele fotovoltaice cu o branşare trifazică paralelă prin intermediul unui invertor din cadrul reţelei publice de alimentare cu energie electrică. Dispozitivul de deconectare automată este parte integrantă a invertorului menţionat anterior. Acesta serveşte drept înlocuitor al dispozitivului de deconectare cu funcţia de izolare, pe care furnizorul reţelei de distribuţie îl poate oricând accesa.

Reguli şi standarde aplicabile:

DIN V VDE V 0126-1-1 (VDE V 0126-1-1):2006-02 şi „Generator în reţeaua de distribuţie publică de joasă tensiune, ediţia a patra, 2001, norme privind racordarea şi funcţionarea în paralel a generatoarelor din reţeaua de distribuţie publică de joasă tensiune" cu adăugirile VDN (2005) din partea Asociaţiei Germane de Electricitate (VDEW) şi a Asociaţiei Operatorilor de Reţea (VDN).

Conceptul de siguranţă al produsului reprezentativ susmenţionat corespunde, la momentul emiterii prezentului certificat, specificaţiilor valide privind siguranţa pentru utilizarea specificată în conformitate cu normele.

Număr raport: **11TH0291-VDE0126**
Număr certificat: **U12-0192**
Data emiterii: **2012-03-16** **Valabil până la:** **2014-07-27**

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Πιστοποιητικό ελλείψεως κωλυμάτων

Εντολοδότης: **Delta Energy Systems Germany GmbH**
Tscheulinstraße 21
79331 Teningen
Γερμανία

Παραγόμενο προϊόν: **Ανεξάρτητη διεπαφή μεταξύ μιας δικτυακά παράλληλης αυτοτροφοδοτούμενης εγκατάστασης και του δημόσιου δικτύου χαμηλής τάσης**

Μοντέλο: **SOLIVIA15EUG4TL; SOLIVIA20EUG4TL**

Προβλεπόμενη χρήση:

Ανεξάρτητη διεπαφή με τριφασική επιτήρηση δικτύου σύμφωνα με το DIN V VDE V 0126-1-1:2006-02* για φωτοβολταϊκές εγκαταστάσεις με τριφασική παράλληλη τροφοδοσία μέσω αναστροφέα στο δίκτυο της δημόσιας παροχής. Η ανεξάρτητη διεπαφή είναι απαραίτητο εξάρτημα για τον προαναφερθέντα αναστροφέα. Λειτουργεί εφεδρικά για την περίπτωση διεπαφής ανοιχτής στην εταιρεία διανομής δικτύου (εταιρεία ηλεκτρισμού) με λειτουργία απόζευξης.

* *with a dc-injection <0,5% of $I_{AC,nom}$*
49,5Hz<f<50,5Hz (Continent)
Disconnection time <500ms
Reconnection time >180s

Βασικά στοιχεία ελέγχου:

DIN V VDE V 0126-1-1:2006-02 και „Οδηγία για σύνδεση και παράλληλη λειτουργία από αυτοτροφοδοτούμενη εγκατάσταση σε δίκτυο χαμηλής τάσης" της „Ένωσης ηλεκτρολογικών έργων Γερμανίας- VDEW-".

Η έννοια της ασφάλειας ενός προαναφερθέντος αντιπροσωπευτικού προϊόντος αντιστοιχεί στις προδιαγραφές που ισχύουν τη στιγμή έκδοσης αυτού του πιστοποιητικού έγκυρων προδιαγραφών ασφαλείας για τη συγκεκριμένη χρήση σύμφωνα με τους κανονισμούς.

Αριθμός αναφοράς: **11TH0291-VDE0126_GRE_DelTe**
Αριθμός ιστοποίησης: **U11-902**
Ημερομηνία: **2011-09-30** **Ισχύει μέχρι:** **2014-09-29**

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Verklaring van geen bezwaar

Aanvrager: **Delta Energy Systems Germany GmbH**
Tscheulinstraße 21
79331 Teningen
Duitsland

Product: **Automatisch schakelstation tussen een netparallelle zelfopwekinstallatie en het openbare laagspanningsnet**

Model: **SOLIVIA15EUG4TL; SOLIVIA20EUG4TL**

Reglementair voorgeschreven gebruik:

Automatisch schakelstation met driefasige netwerkbewaking conform C10/11 – 06.2006, Bijlage 3 voor fotovoltaïsche installaties met een driefasige parallelvoeding door middel van gelijkstroom-wisselstroommutator in het net van de openbare voorziening. Het automatische schakelstation vormt een integraal bestanddeel van de hoger vermelde gelijkstroom-wisselstroommutators.

Controlebasis:

C10/11 – 06.2006
DIN V VDE V 0126-1-1:2006-02

Een representatief testpatroon van het hoger vermelde product voldoet aan de op het moment van de uitreiking van dit attest geldende veiligheidstechnische eisen van de vermelde controlegrondbeginselen voor een reglementair voorgeschreven gebruik.

Rapportnummer: **11TH0291-C10-11_DelTe**
Certificaatnummer: **U11-905**
Datum: **2011-10-04** **Geldig tot:** **2014-10-03**

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Certificat de conformité

Demandeur: **Delta Energy Systems Germany GmbH**
Tscheulinstraße 21
79331 Teningen
Allemagne

Produit: **Dispositif de déconnexion automatique entre un générateur et le réseau public à basse tension**

Modèle: **SOLIVIA15EUG4TL; SOLIVIA20EUG4TL**

À utiliser conformément aux réglementations:

Dispositif de coupure automatique avec une surveillance du réseau triphasé, conformément à DIN V VDE V 0126-1-1:2006-02, pour des systèmes photovoltaïques avec un couplage parallèle triphasé, via un convertisseur dans l'alimentation électrique publique. Le dispositif de coupure automatique fait partie intégrante de ce convertisseur. Il remplace l'a ppareil de déconnexion avec une fonction isolante, auquel le fournisseur du réseau de distribution peut accéder à tout moment.

Synthèse des dispositions de prévention

Séparation galvanique	Polarité d.c. à la terre	Dispositions pour la prévention	Dispositif est capable
Oui	Non	Cas 1 – Champ PV sans polarité reliée intentionnellement à la terre et avec séparation galvanique	Non
Oui	Directe	Cas 2 - Champ PV avec polarité reliée intentionnellement à la terre et avec séparation galvanique	Non
Oui	Par Résistance	Cas 3 - Champ PV avec polarité reliée intentionnellement à la terre par résistance et avec séparation galvanique	Non
Non	Non	Cas 4 - Champ PV sans polarité reliée intentionnellement à la terre et sans séparation galvanique	Oui

Réglementations et normes appliquées:

UTE C 15-712-1:2010-07, DIN V VDE V 0126-1-1:2006-02 et «générateur au réseau électrique basse tension public, quatrième édition 2001, le guide de connexion et d'utilisation parallèle des générateurs dans le réseau électrique basse tension » avec les additions de VDN (2005), provenant de l'Association allemande du service public de l'énergie «VDEW» et l'Association d'opérateur d'un réseau «VDN».

Un echantillon représentatif des produits mentionnés ci-dessus correspond à la date de la delivrance de ce certificat en vigueur des exigences de sécurité technique et pour l'utilisation conformément à sa destination.

Numéro de rapport: **11TH0291-UTE C15-712-1_DelTe**

Numéro de certificat: **U11-910**

Délivré le: **2011-10-05** **Valide jusque le:** **2014-10-04**

Achim Hänchen

primara
Test- und Zertifizier-GmbH

Certificado

Solicitante: **Delta Energy Systems Germany GmbH**
Tscheulinstraße 21
79331 Teningen
Alemania

Producto: **Inversor fotovoltaico**

Modelo: **SOLIVIA20EUG4TL EOE48010364**
SOLIVIA15EUG4TL EOE48010362

Que los inversores de conexión a la red citados en este documento cumplen con la normativa española sobre conexión de instalaciones fotovoltaicas a la red de baja tensión.
En concreto cumplen con las funciones para seguridad de las personas y de la instalación mediante el empleo de técnicas equivalentes al aislamiento galvánico de un transformador, de acuerdo con el Real Decreto 1699/2011.
Los inversores incorporan una unidad de monitorización de corriente residual (en inglés RCMU: Residual Current Monitoring Unit), sensible a todas las corrientes de defecto que actúa con un umbral de respuesta de 30 mA. Los relés de corriente alterna desconectan de forma segura la red en caso de fallo. Dispone de vigilancia de aislamiento y control de puesta a tierra en el lado de tensión continua DC antes de la conexión a red. Estas funcionalidades han sido probadas y certificadas según la DIN V VDE V 0126-1-1:2006:02. La corriente continua inyectada en la red de distribución por el inversor es inferior al 0,5% del valor eficaz de la corriente nominal de salida, medida tal como indica la "Nota de interpretación de equivalencia de la separación galvánica".
El tiempo de reconexión de los inversores es de al menos 3 minutos conforme a la norma IEC 61727 una vez que los parámetros de la red vuelven a estar dentro de los márgenes permitidos.
Las funciones de protección para la interconexión de máxima y mínima frecuencia (50,5Hz y 48,0Hz, respectivamente) y de máxima y mínima tensión (fase 1 U_n+10%, fase 2 U_n+15% y U_n -15%, respectivamente) están integradas en el equipo inversor, existiendo imposibilidad de modificar los valores de ajuste de las protecciones por el usuario mediante software.
Los equipos disponen de protección frente a funcionamiento en isla.

Bases de certificación:

RD 1699/2011 y DIN V VDE V 0126-1-1 (VDE V 0126-1-1):2006-02 y Nota de interpretación técnica de la equivalencia de la separación galvánica de la conexión de instalaciones generadoras en baja tensión.

El concepto de seguridad de un producto representativo ya mencionado, corresponde en el momento de la emisión de este certificado de especificaciones válidas de seguridad para el empleo especificado conforme a reglamentaciones.

Número de informe: 11KFS109-02

Número de certificado: 12-049-00

Fecha: 2012-07-05 **Valedero hasta:** 2015-05-24

Horst Haug

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Businesspark A96
86842 Türkheim
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Potvrzení o nezávadnosti

Žadatel: **Delta Energy Systems Germany GmbH**
Tscheulinstraße 21
79331 Teningen
Německo

Výrobek: **Samostatná spínací stanice mezi síťově paralelním vlastním výrobním zařízením a veřejnou sítí nízkého napětí.**

Model: **SOLIVIA15EUG4TL; SOLIVIA20EUG4TL**

Používaní podle určení:

Samostatná spínací stanice s třífázovou kontrolou sítě dle DIN V VDE V 0126-1-1:2006-02 (s ČR odchylkami podle EN 50438:2007, Annex A*) pro fotovoltaická zařízení s třífázovým paralelním napájením pomocí měniče do sítě veřejného napájení. Samostatná spínací stanice je integrační součástí výše uvedených beztransformátorových (trafolos) měničů. Tato slouží jako náhrada za spínací stanici s dělicí funkcí, která je kdykoli přístupná provozovateli rozvodné sítě (VNB).
** 85%<V<115%*
49,5Hz<f<50,5Hz

Zkušební podklady:

DIN V VDE V 0126-1-1 (VDE V 0126-1-1):2006-02, EN 50438:2007 a „Vlastní výrobní zařízení u sítě nízkého napětí, 4. vydání 2001, směrnice pro připojení a paralelní provoz vlastních výrobních zařízení u sítě nízkého napětí" s doplňky VDN, stav 2005, od elektrárenského svazu (VDEW) a od svazu provozovatelů sítě (VDN).

Reprezentativní zkušební vzorek výše jmenovaného výrobku odpovídá bezpečnostně technickým požadavkům platným v okamžiku vydání tohoto certifikátu, uvedených zkušebních podkladů pro používání podle určení.

Číslo zprávy: **11TH0291-VDE0126_CZE_DelTe**
Číslo certifikátu: **U11-896**
Datum: **2011-09-28** **Platnost do:** **2014-09-27**

Achim Hänchen

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Сертификат за съответствие

Заявител: **Delta Energy Systems (Germany) GmbH**
Tscheulinstr. 21
79331 Teningen
Германия

Продукт: **Автоматичен изключвател между генератор и обществената електроразпределителна мрежа за ниско напрежение**

Модел: **SOLIVIA15EUG4TL; SOLIVIA20EUG4TL**

Експлоатация в съответствие с нормативните актове:

Автоматичен изключвател с наблюдение на трифазна мрежа в съответствие с DIN V VDE V 0126-1-1:2006-02 за фотоволтаични системи с трифазно паралелно свързване посредством инвертор в обществената електроразпределителна мрежа. Автоматичният изключвател е неразделна част от гореупоменатия инвертор. Същото служи за заместител на изключвателя с изолираща функция, до което операторът на електроразпределителната мрежа може да има достъп по всяко време.

Приложими правила и стандарти:

DIN V VDE V 0126-1-1 (VDE V 0126-1-1):2006-02 и „Генератор в обществената електроразпределителна мрежа за ниско напрежение, 4 издание, 2001 г., инструкция за свързване и паралелна експлоатация на генераторите в обществената електроразпределителна мрежа за ниско напрежение" с VDN допълненията (2005) на Германската асоциация на производителите на електроенергия [German Electricity Association (VDEW)] и Асоциацията на мрежовите оператори [Association of network operator (VDN)].

Концепцията за безопасност на гореупоменатия представителен продукт отговаря, към момента на издаване на този сертификат, на валидните показатели за безопасност за посоченото приложение в съответствие с нормативните актове.

Номер на протокола: **11TH0291-VDE0126**
Номер на сертификата: **U12-0191**
Дата на издаване: **2012-03-16** **Валиден до:** **2014-07-27**

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Verklaring van geen bezwaar

Aanvrager: **Delta Energy Systems Germany GmbH**
Tscheulinstraße 21
79331 Teningen
Duitsland

Product: **Automatisch schakelstation tussen een netparallelle zelfopwekinstallatie en het openbare laagspanningsnet**

Model: **SOLIVIA15EUG4TL; SOLIVIA20EUG4TL**

Reglementair voorgeschreven gebruik:

Automatisch schakelstation met driefasige netwerkbewaking conform DIN V VDE V 0126-1-1:2006-02 (afwijkende grenswaarden voor Nederland op basis van EN 50438:2007, Annex A*)
voor fotovoltaïsche installaties met een driefasige parallelvoeding door middel van gelijkstroom-wisselstroommutator in het net van de openbare voorziening. Het automatische schakelstation vormt een integraal bestanddeel van de hoger vermelde transformatorloze gelijkstroom-wisselstroommutator. Deze dient als vervangmiddel voor een te allen tijde voor de distributienetexploitant ("VNB") toegankelijk schakelstation met scheidingsfunctie.

** over spanning 253V*
frequentie 49Hz≤f≤51Hz
scheiding tijd 2,0s

Controlebasis:

DIN V VDE V 0126-1-1 (VDE V 0126-1-1):2006-02, EN 50438:2007 en „Zelfopwekinstallaties aan het laagspanningsnet, 4de uitgave 2001, richtlijn voor aansluiting en parallelle verwerking van zelfopwekinstallaties aan het laagspanningsnet" met VDN supplementen, stand 2005 van de „Verband der Elektrizitätswirtschaft" (VDEW) en van de „Verband der Netzbetreiber" (VDN).

Een representatief testpatroon van het hoger vermelde product voldoet aan de op het moment van de uitreiking van dit attest geldende veiligheidstechnische eisen van de vermelde controlegrondbeginselen voor een reglementair voorgeschreven gebruik.

Rapportnummer: **11TH0291-VDE0126_NED_DelTe**
Certificaatnummer: **U11-900**
Datum: **2011-09-29** **Geldig tot:** **2014-09-28**

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86842 Türkheim
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Certificado de conformidade

Requerente: **Delta Energy Systems Germany GmbH**
Tscheulinstraße 21
79331 Teningen
Alemanha

Produto: **Microgerador em paralelo com redes de distribuição pública de baixa tensão**

Modelo: **SOLIVIA15EUG4TL; SOLIVIA20EUG4TL**

Utilização de acordo com os regulamentos:

Dispositivo de desconexão automática com monitorização da rede trifásica para sistemas fotovoltaicos com um circuito paralelo trifásico através de um inversor na alimentação pela rede pública. O dispositivo de desconexão automática é parte integrante do inversor anteriormente mencionado.

Regras e normas aplicadas:

EN 50438:2007 com as definições de protecção de interface padrão para Portugal. O SOLIVIA15EUG4TL, SOLIVIA20EUG4TL é dimensionado para >16 A por fase, mas todos os requisitos básicos da norma estão cumpridos.

Limites básicos:
sobretensão 264,5 V
subtensão 195,5 V
sobrefrequência 51,0 Hz
subfrequência 47,0 Hz

Aquando da emissão deste certificado, o conceito de protecção de interface de um produto representativo anteriormente mencionado corresponde a especificações de segurança válidas para a utilização especificada, de acordo com os regulamentos. Os testes e certificação foram realizados de acordo com a norma ISO / IEC sistema 5 – Guia 67:2004

Número de relatório: **11TH0291-EN50438_DelTe**
Número de certificado: **U11-903**
Data de emissão: **2011-09-30** **Válido até:** **2014-09-29**

Achim Hänchen

SGS

Certificate No.: SGS/110763

CERTIFICATE OF COMPLIANCE

This certificate is issued to confirm that ***SGS Systems & Services Certification Pty Ltd*** (Electrical Product Certification Services (EPCS) Australia) has certified the equipment / appliance / accessory described hereunder to comply with the minimum safety standards for which the Application has been made by :-

DELTA ENERGY SYSTEM GERMANY GMBH
Tscheulinstraße 21 79331 Teningen
GERMANY

DESCRIPTION OF ELECTRICAL EQUIPMENT

Class:	Grid Connected Inverter Energy System
Product:	Solar Inverter
Trade Name / Manufacturer:	DELTA
Catalogue / Model No(s):	SOLIVIA15EUG4TL / EOE48010362; SOLIVIA20EUG4TL / EOE48010364
Ratings:	Input: 350-800 V d.c.; 1000 V d.c. max Output: 230/400 V a.c.; 3Ph/N/PE; 50/60 Hz; Class I; IP65/IP55 SOLIVIA15EUG4TL / EOE48010362: Input: 46 A (23 A per string); Output :25 A, 15000 W, max 15750 W SOLIVIA20EUG4TL / EOE48010364: Input: 60 A (30 A per string); Output: 30 A, 20000 W
Standard No.:	AS/NZS 3100:2009 + A1 AS 4777.2:2005 and AS 4777.3:2005
MARKING:	SGSE/110763
EXPIRY DATE:	16 November 2016
DATE OF CERTIFICATION:	17 November 2011

For and On Behalf of
SGS Systems & Services Certification Pty Ltd

SGS EPCS Australia, 480 Princes Highway, NOBLE PARK, VIC 3174, AUSTRALIA

primara
Test- und Zertifizier-GmbH

Konformitätsnachweis
Erzeugungseinheit
NA-Schutz

Antragsteller: **Delta Energy Systems Germany GmbH**
Tscheulinstraße 21
79331 Teningen
Deutschland

Produkt: **Photovoltaik Wechselrichter mit integriertem NA-Schutz**

Modell:	**SOLIVIA20EUG4TL**	**SOLIVIA15EUG4TL**
max. Scheinleistung S_{Emax}:	**20,0kVA**	**15,75kVA**
Bemessungsspannung:	**3Ph/N/PE, 230/400V, 50Hz**	
Software Version:	**Red: 1.07** **DSP: 1.24**	

Die oben bezeichneten Erzeugungseinheiten mit integriertem NA-Schutz erfüllen die Anforderungen der VDE-AR-N 4105.
Die Funktionstüchtigkeit der Wirkungskette „NA-Schutz-Kuppelschalter" unter den generellen Anforderungen der Einfehlersicherheit ist gegeben.

Netzanschlussregel:

VDE-AR-N 4105:2011-08
Erzeugungsanlagen am Niederspannungsnetz – Technische Mindestanforderungen für Anschluss und Parallelbetrieb von Erzeugungsanlagen am Niederspannungsnetz.

Ein repräsentatives Testmuster des oben genannten Erzeugnisses entspricht zum Zeitpunkt der Ausstellung dieser Bescheinigung der aufgeführten Netzanschlussregel.

Berichtsnummer: 11KFS109-01_0

Zertifikatsnummer: 11-076-00

Ausstelldatum: 2011-11-17 **Gültig bis:** 2014-11-17

Horst Haug
Zertifizierstelle

Primara Test- und Zertifizier-GmbH | Gewerbestraße 28 | D-87600 Kaufbeuren | T +49 (0) 8341 955 48 93 | T +49 (0) 8341 955 48 94

EC Declaration of Conformity

Producer: Delta Energy Systems (Germany) GmbH
Address: Tscheulinstr. 21, D - 79331 Teningen, Germany

Product description: **Solar Inverter for Grid operation**

Model: **SOLIVIA15EUG4TL** **EOE48010362**
SOLIVIA20EUG4TL **EOE48010364**

The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2004/108/EG Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility

EN 55014-1 : 2006 + A1 : 2009
EN 61000-3-12 : 2005 + EN 61000-3-11 : 2001
EN 61000-4-2 : 2008
EN 61000-4-3 : 2010
EN 61000-4-4 : 2011
EN 61000-4-5 : 2005
EN 61000-4-6 : 2008
EN 61000-4-8 : 2009
EN 61000-4-11 : 2004
EN 61000-6-2 : 2005 / EN 61000-6-1 : 2007
EN 61000-6-3 : 2007 / EN 61000-6-4 : 2007

2006/95/EC Council Directive on the approximation of the laws of the Member States related to electrical equipment designed for use within certain voltage limits

EN 62109-1 : 2010
EN 62109-2 : 2011

The product described above does also comply with the VDE 0124-100.

Teningen, July 7th 2012

Vincent Lin — Head of Product Management LOB ISPV — Name, Function — Signature

Andreas Hoischen — Head of BU LOB ISPV — Name, Function — Signature

This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail.

N4292

approval specialists

Supplier's Declaration of Conformity

As required by Notices under:
section 182 of the *Radiocommunications Act 1992*;

This completed form remains with the supplier as part of the documentation required for the compliance records.

SUPPLIER'S DETAILS

Name of Agent
Approval Specialists Pty. Limited

ACA **Supplier Code Number**, or
N 4 2 9 2

Address of Manufacturer, Importer or Agent
2/9 Packard Ave
Castle Hill, NSW 2154, AUSTRALIA

Australian Company Number (**ACN**)
0 9 4 6 5 6 3 5 4

PRODUCT DETAILS

Product Name, Type and Model
Delta Energy System: PV Inverter; Model: SOLIVIA20EUG4TL-EOE48010364 & SOLIVIA15EUG4TL-EOE48010362

APPLICABLE STANDARDS

Standard Title, Number and if applicable the Test Report Number
EN 61000-6-3: 2007 Generic Standards – Emission standard for residential, commercial and light-industrial environments via report TS11060124-EME from Intertek Testing Services Taiwan Ltd., Hsinchu City, Taiwan dated July 29, 2011.

DECLARATION

I hereby declare that the product mentioned above complies with the above mentioned standards and all products supplied under this Declaration will be identical to the sample identified above.

Signature of Authorised Person

Date: 09 Dec 2011

Print Name
Martin Garwood

Position in Organisation
Managing Director

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Zertifizierungsstelle der BV CPS GmbH
Akkreditiert nach EN 45011 -
ISO / IEC 17011

Einheitenzertifikat

Hersteller: **Delta Energy Systems Germany GmbH**
Tscheulinstr. 21
79331 Teningen
Germany

Typ Erzeugungseinheit:	**Solar Inverter**	**SOLIVIA15EUG4TL**	**SOLIVIA20EUG4TL**
Technische Daten:	Nennscheinleistung:	15 kVA	20 kVA
	Nennwirkleistung:	15 kW	20 kW
	Nennspannung:	400/230V, 3ph/N/PE	
	Nennfrequenz:	50 Hz	

Firmwareversion **1.70**

Netzanschlussregel: **BDEW**-Richtlinie „Erzeugungsanlagen am Mittelspannungsnetz"
Richtlinie für Anschluss und Parallelbetrieb von Erzeugungsanlagen am Mittelspannungsnetz, 2008 und Ergänzung 1/2009, 7/2010 und 2/2011

Mitgeltende Normen /
Richtlinien: DIN EN 61400-21:2008;
Technische Richtlinien: TR3 Rev. 22, TR4 Rev. 5, TR8 Rev. 5
TransmissionCode 2007

Die oben bezeichnete Erzeugungseinheit wurde nach den, in der Netzanschlussregel referenzierten, technischen Richtlinien geprüft und zertifiziert. Die in der Netzanschlussregel geforderten elektrischen Eigenschaften werden erfüllt:

- Erzeugung und Regelung von Wirk- und Blindleistung
- Verhalten der Erzeugungseinheit bei Netzstörungen (Blindstromcharakteristik gemäß TransmissionCode 2007)
- Schutzeinrichtung auf Einheitenebene*
- Ausweis der Netzrückwirkungen
- Validiertes Einheitenmodell: DeltTe_12_074_TR4_SOLIVIA15EUG4TL_V1
  DeltTe_12_074_TR4_SOLIVIA20EUG4TL_V1

Der Hersteller hat die Zertifizierung seines Qualitätsmanagementsystems nach ISO 9001 nachgewiesen.

* Eine erforderliche Prüfklemmleiste ist separat an einer übergeordneten Schutzeinrichtung zu verwirklichen.

Das Zertifikat beinhaltet folgende Angaben:

- Technische Daten der Erzeugungseinheit, der eingesetzten Hilfseinrichtungen und der verwendeten Softwareversion
- Den schematischen Aufbau der Erzeugungseinheit
- Zusammengefasste Angaben zu den Eigenschaften der Erzeugungseinheit

BV Projektnummer: **11TH0291**

Zertifikatsnummer: **12-074**

Ausstellungsdatum: **2012-04-26** **Gültig bis:** **2017-04-01**

Zertifizierungsstelle

Dieter Zitzmann

D-ZE-12024-01-01

www.solar-inverter.com

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Support Email: support@solar-inverter.com
Sales Hotline: 0180 10 SOLAR (76527)
Support Hotline: 0180 16 SOLAR (76527)
Mondays to Fridays from 8 am to 5 pm (apart from official Bank Holidays)
(3.9 ct/min.)

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August 23, 2012